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THE HEALTH OF THE CHILD OF SCHOOL AGE

OXFORD MEDICAL PUBLICATIONS

THE HEALTH OF THE CHILD OF SCHOOL AGE

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BY
VARIOUS AUTHORS

WITH A FOREWORD BY
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FOREWORD

In the following pages we have an illustration of one of the many-sided activities of the Institute of Hygiene. By means of Science Lectures and Demonstrations the Institute seeks to bring up-to-date information within the reach of all who are interested in health and welfare problems. The Council has spared no efforts to obtain lecturers specially qualified to deal with the subjects upon which they speak. For this, and other reasons, the objects of the Institute commend themselves to those members particularly who are teachers, and who are therefore likely to have the opportunity of bringing before groups of children the various aspects of the relationship of Hygiene and Health, and how the latter may be promoted.

A desire has been expressed that the lectures which were delivered a few months ago should collectively appear in book form, under the title of "The Health of the Child of School Age." The volume will meet a real need, for it deals with questions to which at present the public is giving considerable attention. The people wish to be instructed on points of health. It is, for instance, in the early years of life that mistakes in feeding are apt to leave harmful impressions upon the young constitution which it may take years to remove. In the ten lectures in this book a considerable extent of ground has been covered. The subjects dealt with have been wisely chosen, while all the lecturers are men well known in the medical profession and therefore bring to bear upon the theme of their addresses expert knowledge. The opportunity is now given of having a course of lectures, which were much appreciated during their delivery, reproduced in material form, so that they may reach a larger audience, and thus to some extent fulfil the purpose for which they were written.

THOMAS OLIVER.

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THE DENTAL PROBLEM IN RELATION TO SCHOOL CHILDREN

BY SIR HARRY BALDWIN, C.V.O., M.R.C.S., L.D.S.

AN examination of the large series of wonderful portraits and drawings of personages of the Tudor period by Holbein, at Windsor Castle, will reveal that not one shows evidence of the contracted jaw, pinched nostrils and blankly gazing eyes of the adenoid subject. A similar series of present-day portraits would show a large proportion with these signs of maldevelopment. A typical example of a lady of the adenoid diathesis, showing the features mentioned above, occurred in the exhibition of works by the late John Sargent at the Royal Academy. The eyes are wide open and expressionless, the whole nose, especially the region of the nostrils, is pinched and obviously inadequate to satisfy the requirements of normal nasal respiration; the mouth is somewhat open; the jaws are contracted, the teeth prominent; and it may be assumed that the teeth would have been more prominent if dental aid had not been invoked, reducing the number of teeth, and regulating as far as possible those remaining. This lady is a well-marked example of what is characteristic of a great part of our nation at the present time, and illustrates a change which modern conditions have brought about.

If the temporary teeth be lost prematurely in any child showing tendencies to such conditions as above, matters will be made much worse for the permanent teeth. The first permanent molars will come forward in advance of their proper positions, and all the pre-molar and front teeth will find themselves short of room: they will consequently be more crowded and more forced forward than they would otherwise have been. The temporary teeth, therefore, should be credited with an important function in preventing contraction of the jaw.

The temporary teeth are highly useful to the growing child in various ways, and should on no account be allowed to get badly decayed. The function of mastication is a very important one for the child, and should be maintained as perfect as possible, so that the child may eat natural foods freely and with relish, and effective mastication will not only prepare the food for digestion and render it able to give up its vitamins to the system, but will also endow the child with good habits of mastication and preferences for physiologically desirable foods which may last for life.

The new knowledge of nutrition acquired in the last fifteen years has shown conclusively the supreme importance of an adequate supply of vitamins. The modern dietician is anxious above all things that we should get back to more natural foods, and to feeding in a more natural way. This means that we should rely largely on vegetable foods rich in vitamins, and should eat a good proportion of them raw, in which state the vitamins are fully active. This is the kind of food which absolutely demands thorough mastication, both in the case of children and adults; and unless the teeth are very efficient as grinders, with the working surfaces of the back teeth capable of fitting very perfectly together like millstones, the upper row to the nether row, such mastication is impossible. Extraction of a few teeth from a set which began by being an efficient triturating apparatus will cause displacement of the rest—with the result that the mill is completely spoilt. Dieticians when recommending raw foods for the sake of their vitamins should realise that an enormous number of present-day people have such dilapidated dental armament that this recommendation is often beside the mark. I suggest that they should recommend for such people that their raw foods should be prepared by means of pestle and mortar, and the substances not merely reduced to small pieces, but really triturated before being introduced into their mouths; otherwise the material will simply pass through the alimentary canal undigested and almost unaltered and the valuable vitamins and salts will not be made available to the system. However, it would seem more desirable that each individual should be able to masticate his own food in his own mouth if possible in the way that Nature intended rather than be dependent on such a roundabout and troublesome method of preparation. The ruminant thrives on green grass, but consider the kind of mastication that Nature has found to be necessary to ensure that result. The grass is chewed and the cud is re-chewed and chewed again, the business lasting most of the day. The adenoid lady with the irregular teeth would not have much chance of extracting vitamins from raw vegetable food if relying on her own powers of mastication. Her condition, in my opinion, can be attributed to an arrest of facial development consequent on a deficiency of vitamins in food supplied to her as a baby and young child, and probably to her mother before she was born, or to a deficient extraction of vitamins from food. In the light of modern science who can doubt that mastication is a most important function?

During child-life after weaning, when growth is actively going on, mastication is specially necessary, as it is also in the case of the expectant mother in the interests of the fœtus, as here again all vitamins are urgently required to activate the chemical changes and metabolism which are proceeding at an extremely rapid rate. So much for insuring for the child an efficient masticatory organ.

Temporary teeth, if allowed to decay badly, will probably cause much pain, which is not in the interest of the child, and through becoming tender or actually painful to bite on will arrest the function of mastication. If allowed to get very badly decayed their pulps will die and ordinarily become septic, and then will poison not only the alimentary canal but possibly the whole system.

Temporary teeth should be inspected thoroughly and if necessary treated by filling at least twice a year. Any cavities of decay should be filled at once. When the cavities are small they are easy to manage. This can be done very often quite effectively by filling with red base-plate gutta-percha after a not too thorough excavation by the dentist. Another most valuable material for easy and effective filling, which again may not require a too drastic removal of the decay, is the combination of cement and amalgam which I had the honour of submitting many years ago to the approval of the profession. The amalgam is pushed into the cement in the cavity while the cement is still soft, the cavity having been dried and kept dry during the process, and the exposed surface of the filling made of amalgam only. We sometimes hear of dentists recommending cavities in temporary teeth to be filled with gold; such teaching is pernicious and will not advance the true interests of dentistry for children.

Dentistry for children should be in the hands of operators of considerable technical ability endowed with much sympathy for children. The dentist should never outrage the child's sense of honour by deliberately deceiving it, and by promising that things will not hurt when he knows the contrary is the case. He should strive to take the child completely into his confidence, stating truthfully beforehand what will hurt and what will not. Telling lies to the child is utterly stupid and wrong, and will lay up untold trouble for the future. If well treated, children soon become, if not so from the first, excellent patients; and most thoroughly enjoy the visits to the dentist. A lady was making an appointment for her little boy and mentioned that it must be on a certain date; she explained that was the date of his birthday, and he always elected to come on his birthday, as it was the greatest treat he could have.

By all means let the children have the best dental attention regularly twice a year from four years upwards.

I was asked the other day whether the decaying of temporary teeth would damage the permanent ones still unerupted. The answer is, that if an abscess forms around the roots of a dead and septic temporary tooth it will occasionally damage the unerupted tooth or teeth. This, however, is quite uncommon. In great majority of cases the abscess bursts through the alveolar bone and gum, evacuates into the mouth, and no damage is done to the permanent teeth. Simple caries or decay of the temporary teeth has no direct effect on the permanent successors.

Temporary teeth which decay and lose their vitality are not so easily eliminated by nature when the time for their shedding arrives. The roots will often resist absorption and therefore be retained. They then form an obstruction to the permanent teeth and cause them to come into irregular positions. The remedy, of course, is timely extraction of the temporary roots.

It is not my intention here to give instruction in the technicalities of dental surgery for children: that is the domain of the dentists; and though I have no doubt that improved feeding will eliminate most of the dental troubles at present so rife, we cannot afford as yet to neglect the biennial visits to the dentist for inspection and treatment. On those occasions when there is nothing to be treated—so much the better.

When unfortunately temporary teeth have become very carious, dead and chronically septic, or have acute abscesses, the teeth should usually be extracted. The danger of septic infection and poisoning is not to be tolerated. There are, however, times when the cleaning out, disinfecting and filling of the root canals of temporary teeth can be done successfully; and this method should be adopted in certain cases. The early treatment of decay in temporary teeth will undoubtedly often prevent decay in the first permanent molars.

The first permanent molars are cut at six years old, and come behind all the temporary teeth without having any predecessors. A sharp look-out should be kept for caries in them, as it often progresses extremely rapidly, and can cause pain of the severest type. These teeth are the largest the patient will ever have, they are the best grinders of all teeth; and it is a misfortune when they have to be extracted. These are of all teeth the most prone to decay. This, however, is mitigated by the fact that the specially weak spot is localised in the middle of the masticating surface and is one of the easiest cavities to fill if taken well in time. These teeth should be specially carefully examined at the biennial visits and should never be allowed to decay badly. The site of the decay is at the bottom of the wrinkles, so-called fissures, in the masticating surface, and if softening or even imperfect calcification can be detected there, by means of the sharp-pointed probe, the wrinkles should at once be prepared and filled even as an anticipatory measure and a prevention of decay. An early filling of this sort, especially when made of metal like amalgam or gold, will induce in time some calcification of the pulp; which is all to the good, as in the event of other cavities forming later on in other parts of the tooth the pulp will be reduced in size and rendered less liable to exposure. If this or any other tooth becomes very badly decayed the dentist's hand may be forced and extraction may be necessary. Extraction of these teeth, however, will always result in some movement of the remaining teeth, and the fitting of the upper to the lower grinders can never be perfect afterwards.

If front permanent teeth decay, they should evidently be treated and filled at the earliest possible moment; and in view of the permanent and definitive saving of the teeth, they should usually be temporarily filled at an early age with red baseplate gutta-percha. This, on account of its requiring less excavation of the cavity, and on account of its special action in preventing the progress of decay, will generally outlast any other material which could be safely and considerately used at this age; thanks to its insolubility it will last for years. The softened dentine, which, being sensitive, is left unexcavated under it, will recalcify and become insensitive under its influence; and it will prove to be the best possible prelude to permanent filling later on.

At ten and eleven years the permanent bicuspids will displace the temporary molars, and by doing so will often bring great satisfaction to the dentist, who will be pleased to see nice new teeth in place of temporary molars which may have become very troublesome through extensive decay.

At this age, therefore, and for some time longer, when this change has come about, the mouth may have a wonderfully sound appearance, when perhaps for years it may have had quite the reverse. All the temporary molars may have been very carious in multiple places and the mouth may have presented a striking appearance of susceptibility to caries. Now for a time it will be entirely or comparatively caries-free.

At twelve years the set of four second permanent molars may be expected to erupt behind the six-year molars, and like them they come at the back of the mouth, without having had any temporary predecessors. The only teeth remaining to be erupted after these are the third permanent molars or wisdom-teeth, which come at the very back behind all the other teeth, and so late that they may be said to be generally outside the limit of school age.

With regard to regulation and expansion of jaw by means of plates, etc., there can be no doubt that the earlier the work is undertaken, when necessary, the better. After the regulation is finished there is nearly always a strong tendency for the teeth or jaws to return to their irregular state : and this tendency increases with the age of the patient. The problem in regard to regulation is a difficult one when children are away at school. These irregularities of the teeth are generally the result of ill-development of the jaws and consequent crowding.

It is an axiom that the size of the teeth in all mammalia, including man, remains fairly constant, while the size of the jaws may be subject to much alteration. This is no doubt accounted for by the jaws and teeth really belonging to quite separate systems : the jaws to the bony skeleton and the teeth to the skin. If the jaws are stunted they will be too small for the teeth, as the teeth may not be reduced in size at all. In irregularities of teeth caused in this way, it is not desirable to try to save all the permanent teeth, as the jaws will never be large enough to hold them satisfactorily even if expanded. When regulating appliances have to be worn, especially those of the fixed type, the cases are apt to be very disappointing when the patient is away at boarding-school. Unless there happens to be a dentist skilled in this particular kind of work resident near enough to the school to undertake the work and see the patient very often and regularly, the result will be doubtful. If the case is a difficult one and the patient must go away to boarding-school, the school should be selected with this object in view ; otherwise a comparative failure can generally be predicted.

The amount of dental disease among children of school age is very alarming. The Chief Medical Officer to the Board of Education, Sir George Newman, estimates that of six million children at the Elementary Schools, three million are in need of dental treatment; that in many areas 80 per cent. of the children between six and eight years old require treatment—in London 81 per cent.,—in the West Riding of Yorkshire 90 per cent.

Dr. Lewis Graham, School Medical Officer in Birmingham, states that 95 per cent. of the school-children of Birmingham require dental treatment. Dr. Wheatley, M.O.H. and School Medical Officer for Shropshire, states that 95 per cent. of the elementary school-children of Shropshire aged five require dental treatment, and that the average number of decayed teeth at this age was 6·6 teeth per child; and that of children aged twelve years and over 96 per cent. require treatment, with an average of 4·7 teeth per child. The number of decayed teeth per child is reduced at this age for the reason I have given above, viz. that eight more or less decayed temporary molars have been recently lost and the new successors have not yet had time to decay. The 4·7 decayed teeth per child at this age of twelve indicate that in nearly every case all four of the great six-year-old first permanent molars are affected.

During the war the condition of the teeth of the young recruits was shown to be simply appalling, the percentage of those requiring dental treatment varying a little in different Commands, but from 80 per cent. to 97 per cent. The effects of dental disease on general health may be, and often are, very serious. Such results as pain and impairment of mastication are, of course, plainly known to everyone. The secondary results may not be so well known,

The Committee appointed by the Government to report on the Dentists Act states in its monumental report that, "Having regard to the large amount of preventable sickness and chronic invalidity, terminating in many instances in premature death, which results from the effect of oral sepsis and decayed teeth, the Committee view the facts which have been brought to their notice (as to the state of the teeth of the nation) with the gravest concern. They are of opinion that the state of affairs revealed should receive early attention, with a view to the improvement of the health of the nation and an increase in its industrial efficiency."

The late dental surgeon to the Evelina Hospital for Sick Children, Mr. R. Denison Pedley, states that "Carious teeth are a source of irritation from which the nervous system may be readily affected, more especially in young and growing children where the condition is unstable and readily responds to abnormal stimulus.

"As a direct source of irritation, pain in the affected tooth may occur, or pain on the same side of the face and head. Both headache and earache, so common among children, apart from any organic disease, are frequently due to and kept up by the same cause."

Mr. Alfred Coleman states that true cases of epilepsy do occur, the result of irritation set up by diseased temporary teeth. Some of these cases had come under his own notice, in which there could be no doubt as to cause and effect.

Mr. R. Denison Pedley instances several cases of chorea, where treatment of badly diseased teeth was followed by a cessation of all choreic movements. He mentions that of a number of children admitted to hospital for diseases of the alimentary canal, an abnormally large number had bad teeth. He gives particulars of diarrhœa of long standing being quickly cured by the cleaning up of a septic mouth. He, writing in 1895 on *Diseases of Children's Teeth*, clearly sets forth how toxins from putrid teeth not only disturb the alimentary canal, but when taken up by the lymphatics of the stomach and intestines they pass into the blood-stream. Headache, nausea and vomiting follow, showing a disturbance of the nervous system. The temperature rises somewhat and anæmia supervenes. He also gives the following notes of a case at the Evelina:

> Jessie Hamilton, admitted under Dr. Wainwright as a case of tubercular meningitis. Emaciation extreme, marked anæmia, constant vomiting. Breath most offensive, The child seemed almost moribund. The mouth was cleaned with Pot. Permang. for three days, then seven teeth were removed. She was given full diet. In eight weeks her weight increased from 2 st. 11 lbs. to 4 st. 8 lbs. Seven months later she weighed 5 st. 11 lbs. Dr. Wainwright believed the symptoms were entirely due to the swallowing of pus.

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He quotes Sir G. Sims Woodhead in suggesting that the diplococcus pneumoniæ may remain in the mouth for some time without causing any symptoms. Finding its way into healthy lung-tissue it will have no effect;

but if there is slight inflammation or congestion it is enabled to grow on the exuded fluid constituents of the blood and to set up at once those intense inflammatory changes characteristic of croupous pneumonia or acute inflammation of the lungs. This organism is generally to be found in the inflamed area which so often occurs at the apex of a dead tooth. He says also that this micrococcus has been found in diseases of the middle-ear and in meningitis; thus suggesting the transmission of this organism from the mouth to the pharynx and so along the Eustachian tube, setting up the inflammatory mischief.

He also states that an infective focus about a carious tooth may produce general *malaise* followed by malnutrition, thus paving the way for diseases which often seem to lie in wait until a favourable opportunity is afforded of exercising a malign influence on their youthful victims. He also says: "A careful examination should be made of the mouth in every case of illness. This should be a matter of routine, and where clinical reports are made as in hospital practice, a note should be entered as to the condition of the teeth and gums, with the same regularity as the condition of the tongue." I mention rather fully some of Mr. R. D. Pedley's statements as showing that he, writing over thirty years ago, had a clear appreciation of the widespread systemic ill-effects of the septic condition caused by carious teeth. Time has more than confirmed his conclusions.

PREVENTION

What an inestimable benefit it would be if we could prevent dental caries and irregularities of the teeth by more scientific feeding. That such is possible I have no doubt. Food and feeding, I feel convinced, are at the bottom of all the trouble.

Dental caries is known to be due to an attack on the outside of the teeth by certain acids and by micro-organisms which make their way from the circumference to the centre. The acids are formed by the micro-organisms acting on certain constituents of the food, mainly the carbohydrates—sugar and starches. The destructive process is favoured and conditioned by certain *predisposing causes;* the most important of which are crowding and irregularity of the teeth; faulty construction of the teeth; saliva deficient in alkali; and a lowering in tone of general health. In my opinion all these can be altered by different feeding. It is well known that dental caries almost always accompanies an artificial mode of living; that it is, in fact, a disease of civilisation. That being so, we have surely only to find out what are the particular features in our civilised mode of life which specially conduce to it, and to remedy those items in order to effect prevention of the results.

The crowding and bad construction of the teeth and stunted jaws are due to causes which take effect at a very early age of child life, *i.e.* when jaws and teeth are being formed or are having their foundations laid down. But the foundations are being laid down in the early weeks of intra-uterine life, and the actual and visible formation of teeth begins about the eighth week of intra-uterine life.

This means that the food of the mother at the commencement of pregnancy should contain all the constituents for building up the developing organs in right proportions. The same applies to the child all through the period of formation of the teeth, which means up to the eighteenth year.

The great fault in our present-day system of feeding seems undoubtedly to be the deficiency of various vitamins—vitamins A, B, C and D, and maybe others. Our food has surely been deteriorating steadily in vitamin content for years. The causes for this are many, among which the chief may be stated as :

(1) The increasing use of high-milled and refined wheat-flour and the consequent removal from it of all vitamins.

(2) The considerable use of high-milled rice, corn-flour, pearl-barley, sago, tapioca, arrowroot, all of which have no vitamins.

(3) The abandonment of rye, whole barley and to a great extent of fresh oatmeal.

(4) The hand- or bottle-feeding of infants.

(5) The use of factory foods, such as all forms of sugar, and all forms of substitute foods, egg-substitutes, custard-powders, jelly-powders, soup-powders, jams, tinned meats, tinned fruits, vegetable margarine, all of which contain little or no vitamins.

(6) The too exclusive use of " muscle meats " (beef, mutton, fish) and the neglect of the internal organs as food. The vitamins of animals are concentrated mostly in the internal organs.

(7) The substitution of tea, coffee, cocoa for home-brewed beer.

The worst blot in our dietary system is undoubtedly an almost exclusive use of extremely-white flour, which is the ordinary flour supplied throughout the length and breadth of the land. It comprises a very large proportion of the total food-stuff of the well-to-do classes, a still larger proportion of the diet of the poor people, and almost the sole food of many poor children. Their bread is made of it, and in one way or another it forms their staple food. Puddings consist largely of it, and so do cakes, biscuits and pastry, piecrusts, sauces, etc. Nothing can excuse elimination of all the vitamins from this most important substance, the wheat flour. In schools, extremely-white flour ought to be entirely barred. The bread should be wholemeal and the white flour for cooking should be stone-milled; that is, until the steel-roller millers will condescend to supply us with flour containing the greater part of the wheat-germ.

Only wholemeal contains the maximum of vitamins from the wheat; stone-milled white flour contains part of the vitamins. In animals and in plants vitamins are to be found only where metabolism and active chemical changes are going on or are to be expected, so to speak. The vitamins in animals are in the cells of glands, in the liver, in the egg, in fish-roe; but not in the muscles. The same is true in the vegetable kingdom. In seeds they are in the embryo or germ and in certain active cells of the skin of the seed; they are not in the store of starch which constitutes the larger part of the seed, and which is to be merely absorbed by the embryo plant as it develops into a young plant, and which store is the sole constituent of our extremely-white flour.

In the human body the analogy would seem to be complete. Wherever active metabolism is to go on, or chemical action in the cells, or growth, there the presence of vitamins is essential; and vitamins proportional in amount to the work to be done. As no vitamins are produced in the human body, but only taken in from the food, it is obvious that there must be a regular intake of vitamins along with the food to enable the ordinary physiological processes to go on; *a fortiori* in the developing embryo and in the case of the growing child they are called for insistently to activate the relatively enormous amount of chemical change and metabolism going on.

No vitamin should ever be separated from the food-stuff which it naturally accompanies. There is only enough vitamin present to activate to the necessary extent the cells contained in that particular food-stuff. There is never an excess of vitamin to be depended on. If all the vitamin is removed from the bread or flour, it is improbable that it will ever be made up from other sources. The large amount of carbohydrate then is unbalanced by vitamin B and the unvitaminized portion becomes actually poisonous. It will have a damaging effect on development and health possibly by damaging the endocrine glands.

Prof. Plimmer in his latest book (1925) says: " The question is whether the foods that contain vitamin B have enough of it to balance the foods that have none. The answer is decidedly No. The more food eaten (of all sorts) the more vitamin B required." And again he says: " There is no justification for the statement, so often made, that white-bread eaters get plenty of vitamin B from the rest of their mixed diet. The chief natural supply of this vitamin is in the seeds of plants; and if the germ and bran are removed from our staple cereals by the milling, the vitamin B is removed, and its loss can only be compensated for by the addition of some specially concentrated vitamin B food, such as yeast extract (marmite). The amount of yeast used in ordinary bread, about 2 per cent., is too small to be of any account. The figures show that 6 per cent. or 8 per cent. of yeast-extract, which is much stronger than baker's yeast, is necessary for pigeons.

"To prove the delicacy of this balance of vitamin B and the fuel foods, some old experiments of Braddon and Cooper, often overlooked, may be referred to. They fed birds upon a certain quantity of white rice and a certain quantity of yeast, say, *X* white rice and *Y* yeast, and the birds were quite well when the balance was as *X* to *Y*. On doubling the amount of rice and leaving the yeast the same, *i.e.* 2*X* to *Y*, the birds developed beri-beri. Some of our own experiments have confirmed this and also showed that fat must be balanced by vitamin B, even cod-liver oil and even protein must be balanced by vitamin B."

Vitamin B therefore should be proportionate in amount not merely to the carbohydrate element, but to the total quantity of food of all sorts consumed. Yet there are some who still teach that it does not matter about vitamin B being removed from the bread. It may be noticed, however, that they never mention anything about the large quantity of white flour consumed in forms other than bread and which has not the advantage even of a modicum of yeast.

To my mind explanation of most of our diseases of civilisation, including badly developed jaws and badly formed teeth, is to be found in our inadequate vitamin intake.

What is the use of worrying so much over the question of disturbed endocrine activity, without trying to discover the cause of such disturbance—which is again probably improper feeding, and the remedy for which seems fairly obvious.

There are additional reasons for not over-milling the flour, for besides this chief loss (of vitamins) there is also a loss of nearly all the fat, most of the valuable mineral salts, and all the best proteins. The loss of vitamin is important in all classes of society. The other losses are important in the poorer classes.

At Christ's Hospital (the Bluecoat) School at Horsham no highly whitened bread enters the establishment. The bread is all wholemeal or stone-milled yellowish-white; but I am not sure what happens about the flour for puddings and cooking. The school Medical Officer, Dr. Dear, is enthusiastic about the benefit to the boys' health of having eliminated the extremely-white bread.

Reduced tone and lowered health favour the onset of dental caries. A most certain way to reduce tone is to feed improperly. When health and tone are lowered, the oral secretions, mucus and saliva are vitiated. Micro-organisms and decomposition in the mouth are increased. The oral mucus and the saliva should give an alkaline reaction, and here we encounter the question of fresh fruit. The eating of fruit increases the alkalinity of the saliva; it increases the alkalinity of the blood, and increases the total reserve of alkalinity in the system. As regards the immediate causes of decay, wholemeal bread is a more detergent and less clinging substance when masticated and conduces to a clean mouth more than the extremely-white bread. Every meal should be finished with fruit, as the chewing of fruit mechanically cleans the teeth and removes adherent carbohydrate, and reflexly stimulates the salivary glands to flood the mouth with an increased quantity of highly alkaline saliva—a most desirable state of things.

Professor Pickerell of Otago found that the teeth of certain Maori children living under primitive conditions were caries-free; and that other Maori children who had come under our own methods of feeding were not at all caries-free. The alkalinity of the mouths of the caries-free children was determined to be twice that of the others.

Children should be taught to use the tooth-brush more as a gum-brush than a tooth-brush. Thorough and regular gum-brushing before and behind all over twice a day is the most essential part of oral hygiene, and will do a wonderful amount of good. It prevents decay, prevents sub-gingival tartar, and prevents pyorrhœa. Slightly saline water is, I believe, the best lotion to use with the brush, from the point of view of health. No dentifrice, antiseptic or otherwise, seems to have any good effect. Facilities and time for children to carry out their tooth- and gum-brushing should be afforded them in every school. If it is afforded only once a day, that once should be after the last meal, or last thing at night. The ideal would be after every meal.

To influence the child's mind *re* oral hygiene, it is very important to enlist the co-operation of the doctor and to get him to advocate the same ideas as the dentist. The dentist should consider it one of his chief duties to impress on each child his ideas on oral hygiene. Where a school is large enough it should have its own dental clinic. Where the schools are too small for this there should be a municipal clinic for the children to go to. The object should be to preserve the child throughout from serious dental decay and to turn him or her out at the end with an efficient and healthy mouth. They will have acquired from the dentists an interest in the matter which will probably last them for life. A tooth-brush drill seems to be a valuable exercise. The children are drawn up in orderly formation, each having in one hand a tumbler of cold water and, say, salt; in the other a tooth-brush. The instructor stands in front of them similarly armed and goes through the demonstration step by step, explaining each; and the children follow suit.

The problem of dental attention on the complete scale for all children of school age is no longer so acute as it was. The children of those parents who pay for their children's education presumably have their teeth attended to regularly either in the holidays by the family dentist, or by the school dentist during school hours. The children of those whose responsibilities are largely lifted from them and attend the State schools have their teeth attended to at the expense of the Board of Education, at the Public Elementary Schools, at the Continuation Schools, and at the Pupil Teacher Centres, so that dental treatment will now be part of the curriculum of every school-child from the youngest to the oldest. In all areas no fee at all is charged in necessitous cases, but in some areas a small fee is charged, 6*d.* per head for complete treatment; in some cases, 1*s.*, in some 1*s.* 6*d.* up to 2*s.* 6*d.* per head; in some schools each child is asked to put 1*d.* in the box.

I am indebted to the *Dental Record* for some of the following details. The Board of Education, September 1925, issued a regulation that all Local Education authorities shall make arrangements for the dental inspection and treatment of school-children. This will now be compulsory on all Education authorities. The regulations require that the children shall be attended to on joining the Public Elementary School; again when they reach the age of eight, and again when they are twelve. This is obviously not often enough, and doubtless after the lapse of some time the compulsory examination and treatment will be made more frequent. They ought to be at least annual if not biennial to be a certain preventive of serious decay. With proper feeding the need would be lessened.

School dentistry will have a powerful influence for good in educating the children on dental matters, particularly on feeding and on oral hygiene. Moreover, the stopping of incipient decay will have a great effect in preventing further decay even in other teeth, so that the number of teeth attacked will rapidly diminish. In the end the liability to caries and the amount of dental work should be greatly lessened.

That this is so is proved by the case of Cambridge, where Elementary and Secondary School dentists have been in operation longer than in any other town in Britain. As a result of the dental work there, the incidence of dental caries per child has greatly diminished. There will in time be less justification for the dentist to be defined as he was in the *Brighton Herald* of 1826 :

> " A dentist here makes teeth of bone
> For those whom Fate has left without,
> And finds provision for his own
> By pulling other people's out."

The Annual Report of the Bradford School Medical Officer which is annexed to the report of the Medical

Officer of Health, states in the section dealing with dental treatment that at one time only the children between five and eight years of age were inspected and had the opportunity of receiving treatment. Since then the range of age has gradually extended until as at present when all school-children from babes of three to boys and girls of seventeen and eighteen, attending the Secondary Schools, are inspected and may receive treatment if they so desire. During the year under review (1924) 13,428 children of Bradford received dental treatment.

This is an increase in numbers and is attributed to : (1) Much time formerly spent in inspection only is now more profitably spent in treatment. (2) The gradual education of parents and children in regard to the need for attention to the teeth, and a growing appreciation of the clinic's services.

It is saddening, though, still to find children who are inspected from year to year and who yet, because of the ignorance or indifference of their parents, lose teeth that, with a little attention, could have been made into useful grinders for many years ; parents have the option of declining dental treatment for their children. This year for the first time a charge of 6*d*. for each visit to the clinic has been instituted on the instruction of the Ministry of Health. This the report greatly regrets, and expresses apprehension that it will have a serious deterrent effect on the attendances.

Sir George Newman, Chief Medical Officer to the Board of Education, in his last annual report stated that the average number of dental fillings is about 75 for every 100 children treated, or $\frac{3}{4}$ of one filling per child. In Leeds the proportion is 72 per 100, and Dr.

Wear regrets that the parents do not take more advantage of the excellent facilities for dental treatment which exist in the city.

The dental tables show the amount of work done among the Elementary School population: 48,858 children were examined by the dentists, 31,609 required treatment, and 13,792 actually received treatment. On the other hand, in the Secondary Schools 4,276 children were examined; 2,402 required treatment, and only 103 accepted treatment. The popular desire for decent living and habits, however, is shown by the granting of prizes by the *Yorkshire Post* for "Mother-craft," "Care of the Teeth," and for essays on care of the teeth. Many hundreds of mothers and children in the district entered for these, and much good has resulted both directly and indirectly.

To recapitulate as regards prophylaxis; the health of the mouth and teeth is intimately connected with the health and tone of the whole body, and feeding is of prime importance. The food should be adequate in quantity and correct in quality and in balance of the various food factors, particularly in regard to vitamins.

No carbohydrates unbalanced by a sufficient quantity of vitamin B should be taken. This means (1) that cane or beet sugar must only be taken sparingly; (2) that the ordinary extremely-white bread and flour must be eliminated. Vitamins A and C must be provided for. Raw fruit should be taken in considerable amount. Every meal should be finished by masticating some, if even it has to be a small quantity of fruit. Gum-brushing and tooth-brushing should be practised with weak saline water. Ideally this should be done after every meal. If only once a day, then after the last meal or last thing at night; and no sweets allowed afterwards. When it is desired to polish off stains from the teeth, a tooth powder or paste may be used, but not oftener than necessary for the purpose of polishing, and not with the idea of enhancing the health of the mouth and teeth.

I have given considerable attention to the visible effects of the various types of tooth powder and paste, and my conclusion is that all are worse than useless in preventing decay, and many of them distinctly increase it.

Unfortunately teeth, which should be valuable organs and a prized possession, at the present day are such as to suggest that the possessors of them are living under a positive and most effective curse. They are constituted with their battery of concealed and most wicked nerves, and they have a woeful capacity for septic material and for supplying poison or toxins to the general system when " dead."

Then, again, much of the dentistry is a repugnant ordeal and comparatively imperfect, so that all avenues of prevention should be most studiously explored.

If science has discovered the weak spots in our customs, and they have mainly to do with our feeding, we may take heart of hope, for with the diffusion of knowledge, and the faith which saves, we may hope as a nation once more to rejoice in our physical strength and our perfect teeth, like those of our not very distant ancestors.

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THE PREVENTION OF NERVOUS AFFECTIONS IN THE YOUNG

By J. S. Risien Russell, M.D., F.R.C.P.

Before dealing more directly with this subject it is necessary that we should be clear as to what the nervous system is whose maladies it is our object to prevent. It is a very delicate, highly organised and complicated mechanism, whose component parts act and react on each other in their functionings, be these normal or abnormal. This complicated mechanism controls and regulates the workings of every other system or organ of our bodies, so that to preserve normal health it is essential that the nervous system should be kept in good working order. For our purposes, and without going into unnecessary detail, the nervous system may be said to be composed of the brain, spinal marrow and nerves, each of which component parts has its own special work to do, although they all mutually co-operate in a variety of different functions. So delicate is the structure, and so complex the arrangement of the meshwork of communications which knit together the component parts into a concrete whole, that the wonder is that we are any of us able to preserve normal health.

These facts are referred to because so many people speak of the nervous system without any real knowledge of what is meant by the term. People of the kind speak of their "nerves" being affected, or of their friends as suffering from "nerves," without having the faintest idea of what the nervous system is; some vague idea floats in their minds which does not take concrete form, so that it is not surprising that it comes as a shock to many of them when they are informed that the brain forms part of the nervous system. This information leads them to fear that what they had hitherto regarded as nerves is, in reality, commencing insanity, and that they will ultimately go out of their minds, a fear that is usually quite unjustified.

Nature does much to protect against harm to this very delicate and all-important part of each individual, for the brain and spinal marrow are both enveloped by a strong fibrous covering, while, in addition, the former is encased in a bony box, the skull, and the latter is contained in a bony canal in the spinal column. Although the majority of the nerves are not so securely protected in the main, they are so imbedded in other tissues as to derive a considerable amount of protection in this way.

The reason it has been necessary to direct attention to these facts can best be illustrated by two classes of cases. In the one the name is familiar to you—"Meningitis"—and, moreover, its serious import is little less understood. Here we are dealing with a grave and usually fatal affection of the nervous system, in which the coverings of the brain are the seat of inflammation, which is responsible for a variety of disordered functionings of the nervous system, ultimately resulting in coma and death. In the other malady the bones of the spinal column are primarily at fault, while the spinal marrow becomes affected secondarily, resulting in paralysis which most commonly affects the legs. This class of case is not so familiar, and it is only referred to in illustration of the fact that agents provided by Nature to protect the nervous system against harm may themselves prove a source of evils, supplying the morbid process which proves detrimental to it. Cases that come within both of these categories can only be said to be preventable in the sense that a considerable proportion of both are due to tubercle which attacks the coverings of the brain in the one instance, and the bones of the spine in the other. All measures, then, hygienic or otherwise, that are employed in the hope of stamping out tuberculosis in general are equally directed towards the prevention of these affections of the nervous system. In the classes of case with which we have to deal, however, the matter does not rest here, for the successful treatment of tuberculosis already evident in some other part of the body has no necessary bearing on the subject from our standpoint, for it so happens that even successful treatment of tuberculosis in some other part may avail us little, in that with or without such other manifestations of tuberculosis, tubercle may be hidden in some one or other of the glands of the body deep seated and beyond the reach of vision or touch. From a focus of the kind may spring the rapidly acute manifestations of a meningitis, or the slowly destructive process of caries of the spine, which ultimately results in paralysis.

On turning our attention more directly to the subject it is evident that we are assuming a normal nervous system which we are to endeavour to keep in this desirable state. How far is this so, however, in a large proportion of cases? So many children are born with abnormal conditions of their nervous systems that it is quickly evident that we must look further back in their life history if we are to search for the means of preventing these abnormalities.

In so doing our attention is first arrested by the instance of gross damage to the brain or other parts of the nervous system consequent on injuries at the time of delivery, some due to want of skill on the part of the accoucheur, and so preventable, while others are inevitable. Thus, injury to the skull may so damage the brain as to lead to paralysis, which commonly affects the arm and leg on one side, or, on the other hand, traction on the arm may rupture the large nerves at the root of the neck and thus cause paralysis of the limb. Cases of the kind, however, form but a small proportion of the total number of children born with abnormal affections of the nervous system, a condition of things which is to be found due to the maternal state during the pregnancy while the child is still *in utero*, and even before its conception, in which case either parent may supply the reason why the nervous system of the child is not normal; indeed, it may even be some progenitor to whom the blame is to be attached. One of the chief scourges in this connection has been syphilis, and the other alcoholism. The former of these, thanks to a more enlightened manner of facing such problems in the community, is gradually being stamped out, but the latter is still with us, although appreciably less in evidence than heretofore, and I am persuaded is likely to become less and less as time goes on, unless the present tendency to excesses of all kinds is allowed to continue unchecked. Reference to syphilis opens up a large subject which has important bearings on the matters with which we are more directly concerned. It is questionable how far the public realise the full extent of the tragedy which may result from ignorance, and how necessary it is for men to be taught how to avoid syphilis. Let those who are still opposed to this frank way of dealing with the problem consider which is the better, to allow men to continue in ignorance and thus to contract a disease which may perpetuate its scourge through many generations, or to face the subject fearlessly and, recognising the frailty of human nature, teach them how, when yielding to temptation, they can prevent their lapse from visiting untold misery on so many people as yet unborn. Not only does syphilis provide us with a large proportion of children mentally deficient, epileptic, or both, but it may be responsible for cases of paralysis of the brain in some young people, and locomotor ataxy in others, both of which diseases owe their existence solely to syphilis in the parent, without which no such affection in the child would be possible.

Of the factors that have to be considered in regard to abnormalities of the nervous system with which a child is born, the maternal state during the pregnancy supplies a considerable proportion. In many such cases the unfortunate woman is powerless to prevent the abnormal condition of the child, mental or physical, but in no mean proportion the mother is culpable in the fullest sense, for, blest with normal health, she has played havoc with her own nervous system through selfish dissipation, or, owing to some folly, has caused injury to the child still *in utero*. While claiming a large proportion of cases as belonging to this class, it must not be supposed that I wish to minimise the importance of the state of either or of both parents before the child is conceived, for, on the contrary, I had occasion to impress the importance of this aspect of the subject in a lecture which I had the honour of delivering before the Institute of Hygiene some years ago.

Affections of the kind due to prenatal influences include not only mentally defective and possibly epileptic children, but also cases in which, with or without either of these as concomitants, the child is paralysed, such paralysis affecting all four limbs and the trunk, the lower limbs alone, or the upper and lower limbs on one side. It commonly happens that facial grimaces and contortions form part of the picture, and in addition writhing movements of the upper limbs, and it may also be of the lower and of the head and trunk. Speech may be entirely absent or may be exceedingly difficult to understand owing to the articulatory disturbances which result, all of which disabilities may obtain in one whose mind is quite alert and fully alive to them. An instructive feature that comes out in the history of some of these cases is the evidence they reveal of a gradual failure of the reproductive power in the woman, the mother of such children. A history that is not uncommon is that she has had a large family, the earlier members of which are quite normal, whereas one or two towards the tail end are the subjects of disabilities such as have been described, while following on one or more such children there may be a miscarriage or two before the reproductive powers fail altogether and the woman ceases to conceive. On the other hand, there may be no other child born of the marriage.

The difficult problem of the epileptic, the mentally deficient and the insane person is engaging our attention more and more. In searching for means to prevent the occurrence of these cases there are those who advocate "sterilisation" as the means by which such persons should be prevented from procreating, while there are those who, while opposed to so extreme a measure of interference with the liberty of the subject, would rely on "segregation." Both of these views, however, lose sight of the fact that a large proportion of these cases are born of parents in whom no similar defect can be determined. Moreover, those who advocate sterilisation have failed to count the cost that this may prove to the community in the spread of syphilis.

The baneful influence of consanguinity in marriages as providing material for nervous or mental disorders in the progeny has been worn too threadbare to call for more than passing comment, and how well impressed in the public mind are the evils attaching to such marriages is constantly being brought home to me in the course of my work. A way out of the difficulty is the problem one is asked to solve, a problem easy of solution were one not human. Although it cannot be claimed that intermarriage among neurotics is as serious a question as that of consanguinity, it is, nevertheless, certain that such marriages provide soil in the offspring of a nature that readily breaks down under the stress and strain of life, and is accountable for no mean proportion of persons affected by nervous maladies, although infinitely less likely to supply cases of mental deficiency.

Assuming that the child is born of healthy parents, and that its nervous system at birth is in every sense normal, it may be wrecked permanently either from want of knowledge or owing to deliberate neglect or worse, and provide us with a quota of epileptics or neurasthenics of the future. In this connection too much stress cannot be laid on faulty feeding, constipation, an inadequate amount of fresh air and sunshine, and ill-treatment or neglect on the part of those in whose charge the children are left. Knowing as we do that serious consequences may follow shock and blows to the head in adults, who can say how much that is abnormal in a child's nervous system later in life is to be ascribed to frights and blows to the head, deliberately administered, or the result of their being allowed to fall from a chair or pram ? In making this suggestion I do not, of course, encourage the idea that cases of gross mental defect with which children are born are to be ascribed to such blows or falls, an explanation at which their unfortunate parents grasp without justification. But that minor mental defects —epilepsy and various forms of nervous disturbances— may be so engendered is by no means improbable.

Next, a word of warning as to illnesses that may appear simple and of little importance, and which may, nevertheless, have dire consequences in so far as the nervous system is concerned, even to the extent of a fatal issue. First there is Influenza, whose germ produces a poison that has a baneful effect on the nervous system, a fact that is not taken nearly as much notice of as its importance demands. There seems little doubt that the number of neurasthenics among us would be very appreciably reduced if the value of rest and change to the seaside after an attack of influenza were more insisted on, both in the case of

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adults and children. There is need for care in what may appear to be so simple and common a condition as the form of sore throat known as Tonsillitis. Nothing but the ordinary gargles and other household remedies may appear necessary, and yet hidden in this inflammation of the tonsils may be the germ of Diphtheria, quite unsuspected until the child becomes attacked by a form of paralysis in which the heart nerves may participate, resulting in the death of the child. Here is an instance in which a swab from the throat subjected to bacteriological examination might have saved the situation by means of the successful result of anti-toxin treatment. Take another apparently simple and common affection in children, in which there is a discharge from the ear due to inflammation. How few realise to what serious consequences neglect of this may lead, and yet abscess of the brain or fatal meningitis may result from allowing so apparently simple a condition to go untreated.

What is true of the ear is also applicable to chronic affections of the nose and accessory sinuses, as neglected conditions of the kind may result in meningitis or abscess of the brain, but these are consequences to be expected later in life rather than in the young. In like manner infection from the teeth and gums, fraught with such deleterious consequences to the health in general, and to the nervous system as cause of neurasthenia, is a state of things that concerns us but little in young people as compared with those who have reached the later periods of life. It is otherwise when we come to consider the eyes, not so much from the standpoint of disease as in regard to errors of refraction which call for correction by glasses, for there are those who ascribe many nervous maladies to errors of refraction. The importance of correcting such errors as a means of preventing headache is too well known to call for more than passing notice. Then, again, whether legitimately claimed as a cause of any of the more serious nervous affections of early life or not, it is certain that errors of refraction, and any form of irritation about the eyes or eyelids, if neglected, may prove the determining factor or starting-point in one susceptible to a nervous malady, which in the girl is disfiguring and a handicap in regard to matrimony, and in both boys and girls a serious disadvantage in the competition for existence. To the lay observer patients so affected appear to be the subjects of "St. Vitus's Dance," in that the grimaces, twitchings and contortions of limbs, head and body are to them indistinguishable from the disordered movements seen in this disease. In reality it is a malady quite distinct from St. Vitus's dance, and is in a measure preventable. It is known as "Tic," but used to be called "Habit Spasm," owing to the fact that it was supposed to be the outcome of a bad habit. While irritation about the eyes leading to blinking, or about the nose leading to sniffing, may be the determining factor in some cases, making it advisable that all such sources of irritation should be corrected as early as possible, especially in neurotic children, it is certain that in many cases this disordered state of the nervous system reveals itself without any such provocation. It will be evident what a handicap an affection of the kind must be to one seeking a means of livelihood which necessitates his or her working in a room with others, the constant jerky movements proving most irritating to fellow-workers, and if not made intolerable in themselves may become so if, as sometimes happens, grunts and snorts of a most distracting character are added to the jactitations. Important as it is to deal properly with any source of irritation such as has been mentioned as a means of preventing a malady of the kind, far more depends on recognising the general state of nervous instability of the child so as to deal with it before it has become so aggravated as to seek expression in so unpleasant a disorder. If neglected the affection is liable to become chronic, so that it cannot be too strongly impressed that cases of the kind call for treatment, and that the idea that left to themselves the children "grow out" of the affection is erroneous.

St. Vitus's dance itself is one of those affections to be ascribed to the action of a germ and is closely related to Rheumatism, like which disease it is very liable to affect the heart, causing valvular disease, but we know of no means by which this malady can be prevented. The children exhibit facial grimaces, contortions of the head, trunk and limbs much in the same way as in the affection we have just considered, while speech may become quite impossible, as may mastication, and swallowing most difficult.

The disease Rickets, which is well known, may be complicated by spasm causing contraction of the child's hands and feet, a state of things that is in no way serious. It is otherwise, however, when, instead of this mild disorder of the nervous system, a more general affection is met with in which the spasms may be so severe and so widespread as even to raise the possibility of the existence of so grave and fatal a malady as Tetanus or Lock-jaw. This more severe spasmodic affection that may complicate rickets is known as Tetany, and is an affection that may be generated in a variety of ways, some, apparently depending on general failure of nutrition, others on the existence of some poison in the system, notably generated in the stomach or some other part of the gastro-intestinal tract, and in which even so simple a condition as intestinal worms in a child would appear to be capable of inducing the affection. How to prevent a disorder of the kind in a child is made evident by what has been said as to the causes which induce the affection.

When actual disease is responsible for the disordered functioning of the nervous system it has to be admitted that a large proportion of these maladies are beyond our power to prevent, for the reason that we are ignorant of the real cause of the disease. Let me call attention to a few striking examples. There is a malady to which the young are especially prone, and which at one time was almost exclusively a disease of children, so much so that it became known as "Infantile Paralysis." Most people have, no doubt, seen examples of this in children with one or more limbs that are paralysed and withered, atrophy of the muscles and retarded development of the bones being special features of this affection. Here we have a disease with all the features of an acute infective febrile malady which we are powerless to prevent. Although at its incidence it presents all the features of a disease due to a germ, and has been known to present itself in epidemic form, it more usually happens that sporadic cases are met with, isolated examples occurring here and there. It also rarely happens that more than one child is affected in the same house at the same time, which is very different from what we expect in most diseases known to be infective in origin. This fact should not, however, lead us to neglect the ordinary rules and precautions applicable to infectious diseases in so far as isolation of the sick child is concerned, so as to avoid contact with other children, for the reason that the infective agent may be changing in its virulence and, accordingly, at any time may become contagious or even infectious. The occurrence of epidemics, though few, lends support to this possibility, and whereas there was a time when the disease was almost entirely confined to children, it now commonly attacks young adults. The previous fitness of the individual affected has no say in the matter, for both in the case of adults and children the most robust are commonly affected; indeed, in a family of several children in which some are less healthy and robust than others, it often happens that one of the strongest is selected by this disease.

Its behaviour in this respect is strikingly similar to a disease of the young which is, however, happily rare in children, though increasingly frequent in the young as years go on. This is one of the affections commonly spoken of as a form of "Creeping Paralysis," the actual name of which conveys to the public little idea of what is meant, but in connection with which the term "Sclerosis" is beginning to be familiar, at any rate as indicating the existence of a form of chronic incurable disease. Here, as in the other malady to which we have just referred, we are powerless to prevent the disease, for although we are well aware of what does harm in the one affected, we are ignorant of its cause, and, accordingly, know of no means by which the malady can be prevented. As has already been hinted, it, like the acute form of paralysis known as "Infantile Paralysis," commonly picks out for attack one of the healthiest and most robust-looking in a family. In both of the diseases that have been cited we have examples of affections in which isolated members of families are selected, but there are other nervous maladies met with in the young in which not only does it become manifest in several members of the same family, but also can be traced through several generations. Here again we are impotent to prevent the paralysis which slowly incapacitates its unfortunate victim, ultimately making him quite helpless in body while leaving him still active in mind. We know of no way of preventing the occurrence of these affections except by attempting to put a stop to the propagation of the species by such advice as we can give those belonging to such families as to the need for avoidance of procreation. Nature helps in this direction, in that of those affected the majority either die or are rendered so helpless by the time that a marriageable age is reached that there is no fear of their propagating the species. It is, however, unfortunately the case that persons belonging to such families not themselves affected may, nevertheless, bear progeny the subjects of this distressing malady.

Turning our attention to the child that has reached the age when its education may be commenced, there is great need for careful discrimination between the child that is naughty and will not learn, as opposed to the child whose brain is incapable of acquiring knowledge, although in other respects the child may appear to be perfectly normal and free from recognisable mental defect. Patient training and being content to go slow may work wonders in time, while harsh handling and punishment wreck all chances of success and do infinite harm, not only in checkmating any chances of improving the mental acumen, but also by being liable to set up one or other of a variety of nervous affections, including even so grave a one as epilepsy. The training of the brain of the child calls for the greatest care and experience, and while it is so all-important that it should be well disciplined for its future well-being, too great care cannot be exercised in the way this disciplining is conducted. I, accordingly, view with horror the introduction of anything so abominable as psycho-analysis in the training of children, and regard this as deserving of the strongest possible protest on the part of the public, for every means should be taken to put a stop to the evil, and enucleate the canker which has taken root among some of those responsible for the training of the young. Apart from this much-to-be-deprecated method of dealing with children, the whole modern tendency of studying the child's whims, and pandering to them for fear of harm resulting from upsetting their mental complexes, and thus allowing them to do much as they please and to go undisciplined, is responsible for much harm. From the perhaps too strict discipline of the Victorian era the pendulum has been allowed to swing too far in the opposite direction, so that the modern child has been allowed to become quite out of hand.

An undisciplined child is one whose nervous system cannot fail to suffer. To begin with, instead of its being fed on such foods as are all-important to the well-being of a nervous system in the process of development, unwholesome messes are allowed to be substituted. If, instead of regarding the child's nervous system from the standpoint of a delicate mechanism which must not be interfered with by our insistence on what we know to be good for it from a nutritional standpoint for fear of upsetting this or that "complex," we regarded it as a mechanism whose normal workings in the future will depend largely on its being made stable by adequate and suitable foods, and a healthy environment both of body and mind, we should be doing much to prevent a great deal of the instabilities of the nervous system met with later in life.

Hygiene of body and mind is much needed in these days, when children are allowed to read the most baneful literature at will, and spend so many precious hours in cinemas, where the mental food may be of the most pernicious type for them, instead of being compelled to reap the benefits provided by Nature in the way of fresh air and sunshine.

Recent utterances in the Press make it evident that these dangers to the young are becoming widely recognised in the community at large, and that not only medical men, but the clergy, schoolmasters and parents, notably mothers, are all becoming alive to the growing evils which attend the modern methods of so-called "training" of the young, so that happily there are already indications of a tendency to return to the former state of things. There is a happy mean to be aimed at, but it would be far better for their nervous systems were young people compelled to return to the strict discipline of the Victorian era than that things should remain as at present, with all the laxity and undiscipline responsible for so much harm.

There must be few parents who do not experience great anxiety and much doubt and uncertainty as to what is best when the child is of an age to be sent to school. In the case of a boy there is little choice except as regards the selection of the school thought most suitable, for, unless prevented through some abnormal state of his mind or body, it is of very great importance for his future career that he should, if possible, go to a public school. In the case of girls there is not, of course, the same compulsion, so that while there are reasons why it may be better to send an only girl to school, these considerations affect the question much less where there are several in a family, in which case a governess at home is sometimes preferred to the possible risks attaching to school life. While recognising that, as in the case of boys' schools, so also in the case of those for girls, evils may exist which prove deleterious to the nervous system, it has so happened that cases of the kind have much more frequently come to my notice in the case of boys than in girls. I hope that head-masters of schools will forgive me for saying that I cannot help wondering if they are as fully alive to the state of things at their schools as they imagine themselves to be, or whether, owing to want of time or other causes, there is not much that escapes their observation. The occasional glaring instances that would appear to justify my suspicion, which reach the public through the Press, do not, I venture to think, give an adequate idea of how prevalent such evils are in some of our schools, as evidenced by cases which have come under my observation, and which, of course, never become public.

A grave responsibility falls on a head-master in these matters, and, despite his best endeavours, evils most detrimental to the future well-being of the nervous systems of the boys concerned may go unsuspected by him. He is much in the hands of his masters, who may or may not be all that is desired, while the "prefect" system, which has so much to recommend it from other standpoints, may actually supply the canker which ultimately pervades and corrupts a school. Abnormal practices of the kind may be responsible for a variety of disordered states of the nervous system, and where of such a nature as to occasion shock, even a mental breakdown of serious import may result. How best to prevent these breakdowns by removing the causes is naturally our first consideration, but it must also be recognised that where such disorders of the nervous system are threatened, or there are signs that they have already commenced, much can yet be done to prevent further development of these abnormal symptoms, and possibly even to bring about a cure.

Let me refer to a case in illustration of what can be done if the condition is recognised sufficiently early, and proper steps are taken to avert a more complete breakdown. A boy affected in this way at school was sent to a home in the country, where he was ordered complete mental and physical rest, and where treatment was prescribed to restore tone to his brain and nervous system in general. After some six months or so of abstention from all studies a little mild tuition for an hour or two a day was allowed, but no serious mental work for a year, by which time so complete was his recovery that subsequently he gained high distinctions in his university career. Without such treatment he would have been doomed to chronic neurasthenia, or, what appeared more probable in his case, a permanent mental breakdown.

Among the subjects which are actively engaging public attention at the present time, Spiritualism takes a prominent place. There are, of course, those who are sufficiently stable and mentally fit to search into these problems without fear of harm resulting to them, but it is otherwise with many who are highly neurotic and unbalanced, and who cannot possibly dabble in matters of the kind without grave risk of disordering their brains as seriously as to cause them to become insane. To quote one instance, a boy whose mental breakdown was so severe that, among other indications of insanity, he "heard voices" and communicated with spirits, would lie on the ground and put his ear to the floor listening to the communications he was receiving from the spirits, would laugh at what he heard, and in general behaved as one out of his mind, it being quite impossible to persuade him that the voices were imaginary and not real, owed his breakdown to spiritualism, in which he had become interested, and the mysteries of which had proved too much for his brain. Under treatment on similar lines to those adopted in the case of the other boy, the whole picture has changed, so that he no longer hears voices and has been able to take up mild studies. Whether his recovery will prove permanent or not has yet to be seen. The public cannot, therefore, be too strongly warned against the risks that are run by people quite unfit for mental strain. An example of the truth of this proved the subject of a recent inquest in a case of suicide when the coroner commented on the dangers attaching to the study of spiritualism by people mentally unsuited to any such strain.

A case that attracted attention in the Law Courts not long ago resulted in a confession by the learned Judge that he was ignorant of what went on in modern society, while a member of the medical profession informed the Court how women of the present day lived on excitement, and kept themselves going by means of alcohol. He might have added "and drugs," for there are evidently still sources through which some women are able to secure drugs to keep themselves going with little or no food and next to no sleep. Distasteful as is the picture to those who remember the healthy lives that women lived formerly, it becomes a national question and one of grave concern where such happenings affect the young women and girls who are to become the mothers of the next generation.

Whether or not the War is to be blamed for the change, the fact remains that the girl of the present day, even when still in her teens, has a freedom of action which is fraught with more than one danger. The chaperon is, in the main, a thing of the past, and young girls are free to go out with young men not only to restaurants and dances, but also to night clubs, with no sort of restriction put on their actions, and with no limit of time when they must return to their homes. The result is that the whole, or the greater part, of the night is spent in frivolity, with no time left for sleep to refresh the nervous system, so that a day following this, full of social and other engagements, can only be got through with the assistance of alcohol or drugs. Girls not long from school are to be seen drinking cocktails, champagne and liqueurs, while in time whiskies-and-sodas are added to the list of stimulants required to keep them going. Scarcely has the age of twenty been reached before the lines that belong to the face of a woman of middle age become evident in such girls. Nature, deprived of her normal hours of sleep, begins to forget the habit; the nervous system, overtaxed by the strain of so abnormal a life, and poisoned by alcohol, tobacco and it may be drugs, falls into a state of neurasthenia, with insomnia, which demands the increase of drugs to bring sleep. Is it to be supposed that when girls of the kind reach womanhood and become mothers they can produce men and woman with anything but the most miserable physiques and of the neurotic type ? Various pronouncements in the Press make it evident that the public is becoming alive to the importance of this subject, which not only concerns the welfare of the individual, but also the future of the nation.

While extremes possibly affect only a comparatively small number of the community, it is certain that a considerable proportion of our girls acquire the habit of living on excitement, which becomes so much a part of their existence that they find it impossible to break this habit and to take to a normal life with any prospect of happiness, so that they unfit themselves for motherhood and the duties and responsibilities of married life.

In conclusion we may say :

(1) A large proportion of affections of the nervous system in the young are only preventable in so far as we are able to deal with those large and far-reaching problems which affect the child before it is born.

(2) A considerable number depend on unknown causes which we are, accordingly, powerless to prevent.

(3) A child, normal at birth, who does not fall a victim to one or other of the maladies due to unknown

causes, can best be protected against nervous disorders on common-sense lines. A healthy environment, plenty of fresh air, as much sunshine as can be secured, good plain food, an abundance of sleep, reasonable discipline, and as much protection as possible from noise, bustle and undue excitement, ought to prevent the average child from falling a victim to affections of the nervous system.

DIET IN SCHOOLS

By L. R. LEMPRIERE, O.B.E., B.A., M.B., Ch.B.

THE topic of Diet in Schools is one upon which many divergent views are held, and upon which almost anyone feels he is entitled to speak and criticise, sometimes perhaps on insufficient data, as witness the correspondence in *The Times* a few years ago.

There are two main schools of thought: (1) that boys and girls are *underfed*, mainly represented by parents; (2) that they are *overfed* or *wrongly fed*, represented by not a few medical men, physiologists, dietetic experts, and those who may be classed as *Food Reformers*, who take various directions and sometimes go to extreme lengths.

I can best approach the subject from the one standpoint upon which I am qualified to speak, and that is twenty-five years' practical experience as Resident Medical Officer in one of our large Public Schools, and my remarks must necessarily apply mainly to them.

Let me take as my text the following extract from a letter recently sent me by a boy's mother. She writes:

"Of course your school is no exception to all public schools, and the food is inadequate for growing boys, especially delicate ones: personally I feel it a bitter ban on us that so much additional food has to be supplied, but all parents are in the same boat."

If this statement with its conclusion be true, it is a serious charge against the public schools; but is it *true?* It must be borne in mind that in schools the cooking must be for the *mass*, and not for the *individual*, who must in the main conform to the general diet, and it is with the mass I am concerned.

Now the diet may be inadequate for two reasons: (1) *Quantity*, (2) *Quality*.

(1) *Quantity*, that is the calorie or energy value. Where the average age is between fifteen and sixteen, a value of 3,200 units, as recommended by Dr. Friend of Christ's Hospital, is none too much; it may well be 3,500 units, as in one school I know, the standard laid down for a man doing moderate work. As Professor Hill says, "It is now recognised that a boy of fifteen requires as much food as a man," and no one who lives amongst growing boys and sees their superabundant energy, and their very strenuous life, both mental and physical, can doubt the truth of this. His expenditure is much greater than yours or mine, and his income must be relatively bigger.

I take it for granted that in all schools this diet is and must be a mixed one, made up of Proteins, Fats, Carbohydrates and Salts, and that the best proteins are derived from meat.

In this paper it is impossible to go into detail as to the exact amount of the various articles that should go to make up this diet, but from the energy point of view there are four main items: *Meat, Bread, Milk, Butter*, which should be the fundamentals and whose amounts are essential.

I have made inquiries from eighteen large representative schools (girls' and boys') on their diets, and their answers, for which I am much indebted, are largely incorporated here.

From their returns, I find that in ten the amount of meat, bread and milk is unlimited; in the remaining eight, meat (uncooked) varies from 7–10 oz., bread from 8–13 oz., milk from ½–¾ pint; butter, the only universally rationed article, varies from 1–2 oz. a day, mostly about 1½ oz. or rather less; in one school some margarine is still given.

In my opinion, 9 oz. of meat, 10 oz. of bread, 1½ oz. of butter and ¾ pint of milk a day should be the allowance, and this represents an energy value of about 2,600 units, and on these fundamentals the rest of the dietary should be built.

A study of the diet sheets, both summer and winter, of these representative schools shows that in them at least, if "unlimited" means anything, the quantity value from the fundamentals is easily obtained, and from that point of view the boys and girls are at least not underfed.

But *Quality* is another matter. We owe a great deal to Professor Sir Gowland Hopkins, Professor Plimmer, whose little book on *Food and Health* should be read by everyone interested, Dr. Hamill and others in this country for the discoveries of and research done in connection with Vitamins and Biological Food Values. Much new ground has been broken, obliging us to readjust our views, both as to the balance of diet and also to the essential requirements of certain articles, hitherto perhaps considered as desirable adjuncts without quite knowing why. I refer to FRESH FRUIT, VEGETABLES raw and cooked, whose energy value may be negligible, though their vitamin content is so high, and to *untreated* CEREALS.

The need for VEGETABLES has always been recognised, but this has been emphasised by our recent knowledge of their being one of the main sources of the essential vitamins. The great difficulty of getting them eaten has also been recognised for years, though one notes that sixteen out of the eighteen schools provide two vegetables daily; greens, lettuces, peas and beans, carrots, tomatoes, potatoes, onions are amongst the best.

It is only comparatively recently that FRESH FRUIT has proved its importance in this respect, and it is a merciful dispensation of Providence that has supplied the modern steam-ship and refrigerator to supplement our meagre home-grown stock.

But the necessity for fruit has scarcely leaked into many public schools as a fundamental, and is supplied indirectly only out of the boys' pockets: it is an article they will always buy. From my schools list, at five there is no fruit; nine have it occasionally, *i.e.* once a week in winter and a few extra times in summer; whilst in three girls' schools and one mixed it is given every day.

Here then is a point for just and definite criticism: the lack of fruit and vegetables, particularly in the winter months, when most needed.

The supply of Vitamin A is mainly derived from ANIMAL FATS, in which Butter and Milk figure prominently, and if the amounts I have suggested are given, or the adjective "unlimited" is correct, the supply will be adequate; but look at the cod-liver oil bill, the stand-by of parent and doctor alike, which in many cases tells a tale of deficient fat supply. One must remember, however, that cod-liver oil is vastly richer in this vitamin than any other source, and therefore much less is required. Many boys and girls do not tolerate an abundance of milk: it tends to upset their digestion, or makes them fat and flabby; a condition often seen in convalescence. Moreover, an abundant supply of fresh milk is not always easy to obtain: in times of epidemics it may be a real difficulty. One very important point in this connection is that the milk supply should always be under the supervision of the School M.O.

The important Vitamin B, looked upon by Professor Plimmer as the keystone, is derived very largely from stone-ground flour containing the germ, and it is a dietetic crime to use white flour in its place: only comparatively few, alas, of the schools mentioned have found salvation in this matter, though the Medical Officers of Schools Association did its best two years ago to re-arouse interest in this subject and demonstrate its importance. As Professor Hill says, " White flour should be taxed," and one might suggest this as a source of revenue to the Government.

The *objections* to stone-ground flour come mainly from the false idea that whiteness connotes purity, whereas white flour is a whited sepulchre.

I have found that stone-ground flour bread is both palatable and popular; that if baked with plenty of crust it can be eaten fresh with impunity. It further has the following *Economic Advantages:* boys are satisfied with less; during their last three years the average daily consumption is 2 oz. less; its initial cost per sack is slightly less; a sack of stone-ground yields 4–6 lbs. more bread than a sack of white.

Its *Disadvantages* are that it does not keep so well and does not make such good cakes or pastry.

So much for the broad principles of diet.

How should the diet be distributed?

That there must be three compulsory principal meals a day, and at intervals of about five hours, is generally agreed: if any alteration were needed, and I think not, the difficulties of rearranging the Time Sheet would be very great.

A fixed minimum of 20 minutes for breakfast and tea: 30 minutes is unnecessarily long, and it is not in my experience that the slow eater or small boy is afraid to sit on after others have gone. For dinner, 30 minutes should be the minimum: certain dishes take longer to serve and eat than others: *e. g.* rounds of cold beef and cherry tart against cottage pie and gooseberry fool.

At breakfast porridge made of proper oatmeal (and not of the more expensive and less nutritious proprietary compounds) should be given three times a week in summer, four at least in winter: most schools exceed this. There should always be an extra dish—bacon, fish, egg, sausage—and this is, I think, universal.

Equally at tea there should be an extra dish, and this is not always the case, even at the most expensive schools.

Years ago, when I first got this instituted, I stipulated that it should be *non-meaty*, believing that meat at that meal was harmful to a boy's morals and aroused the animal passions; but lapse of time has proved to me at least that this argument is a complete myth, and in spite of its introduction the moral tone in schools is notably better. The need for some extra is suggested by the fact that before its introduction with us, two very large meat safes used to be filled with the hams, tongues, chicken, etc., supplied from home: since then they have disappeared. Still at this meal I would advocate the fruit, fish, egg or vegetarian dish (several of which have stood the test of time), in preference to meat as a rule.

A study of these school menus shows that in all meat or meaty foods are provided twice a day, and in many three times.

There is nothing to be said about dinner, which is, I believe, adequate in value everywhere, and there is no evidence of stinting.

On two days a week there should be *meat alternatives*: *e.g.* (1) Soup with a good boiled pudding and fruit, or (2) Fish. And on both these days meat might be given at tea.

There is considerable difference in the practice of *supplemental meals*, *i.e.* lunch, afternoon tea, supper. I consider there is a real need for them under certain conditions. They should be *Optional*, for remember that though the average boy's appetite and capacity are very similar, they are not all machines of one pattern, and there must always be some individuals who require smaller amounts at a time, but at shorter intervals.

Where early *First Lesson* exists, this supplemental meal should be compulsory: I may say I am all in favour of this lesson in the summer and first half of the winter term, to the end of October, but no longer. I have never found that this snack of cocoa and bread makes any difference to breakfast; in fact our steward tells me that the summer breakfast is better eaten than the winter one. Practically all our masters take it, and I make all the young boys go.

If there is more than five hours between the chief meals, the small delicate boys need something—a cup of milk in the morning break, tea or cocoa after games and before afternoon school: with us the bigger boys brew tea in their studies, and naturally prefer it.

These supplemental meals appear to be invariable in the Girls' Schools, where no private food is allowed.

The next problems are those of *Cooking* and *Service*, which are almost as important, and in my opinion, and that of almost all my colleagues, are far more likely to be at fault, and in many cases need reform.

There are, as you know, two methods of feeding: (1) by Houses; (2) in a Common Dining Hall. The latter has the very great advantage of *Economy*: it is far cheaper to buy in bulk for 500–800 than for 50 or 60, to cook and provide some service, and all hostel schools have much lower fees than boarding-house schools. (2) The theoretical advantage of being under one controller, and if he or she is a dietetic expert, the advantage may be very real.

But apart from these two points the House System has all the best of it from the cooking and service point of view, and if, as at Eastbourne, and now, I understand, being gradually adopted in some other schools, this house feeding is combined with central buying and catering by the school and not the house-master, then the ideal is reached, provided always that the school M.O. is directly consulted: this proviso is at present the exception rather than the rule, even in schools where there is a Resident Medical Officer; another definite error that needs righting.

In a hostel school of 500 or more it is impossible to get the same good cooking, quick hot service, with good and clean table appointments, such as linen, crockery, flowers and other small refinements, as can be obtained in a boarding house presided over by the master and his wife, nor is it nearly so easy to spot a boy who passes his food or just pecks at it and really wants overhauling.

The principle of a house-master doing his own catering may be wrong and must be burdensome, but I must enter a protest at any suggestion that they deliberately enrich themselves at the expense of their boys. I have never found any evidence to show that in boarding houses there is a less generous or varied diet or, what is after all the best test, less good health; and a study of the diet sheets of these eighteen schools at least, which are fairly distributed between the two types, is if anything in their favour.

As I said, the cooking advantage is all with the boarding house: it is much easier to cook for 50 than 600: this applies particularly to vegetables, eggs and fish: the latter presents great difficulties in bulk cooking to make appetising. Boiled fish is almost universally disliked: fish fried in olive oil cooks much better than in dripping, but it must be eaten hot, and eaten as soon as cooked, and not cooked in batches and kept: this and kedgeree cannot be satisfactorily served in bulk. Herrings and mackerel are excellent, but are often ruined in bulk cooking because of having to wait too long. To circumvent this, only a few tables should be served at the same time with these and similar articles, even at the addition of more labour.

In a hostel school, too, boilers must be used in place of saucepans and pots on the stove, and the results can never be so good.

In any school, in the kitchen the prime essential is a *First-rate Cook:* she (or he) is worth her weight in gold. It is a tragedy to see how often the best food can be spoilt by cooking: the worst forms of it are seen in pastries of all kinds, in boiled puddings, in rice puddings--sometimes delicious, sometimes nauseating; in potatoes and green vegetables, of course, as well as the fish. These should be boiled in a little water for as short a time as possible. Boys will not eat them steamed. Yorkshire pudding is an excellent and very popular adjunct to roast beef, but can be absolutely ruined in the cooking. No school, not even the poorest, can afford a *cheap* cook, who must not only know her own job, but be able to manage the *Domestic Staff* under her, a problem which, as all know, is most acute at the present time. Indeed, school diet and its service is much affected by the present-day state of the labour market.

Outside the kitchen, the essential is a *quick, hot, clean* service. Food and plates should not be brought in till the last possible moment: much improvement can be done by practising the waiters in a rushed service, with a remarkable saving of time and much hotter results. Hot plate-warmers I consider essential. As regards the tables, the supply of clean cloths is a real difficulty, and I prefer scrubbed and sandstoned tables to dirty linen: the supply of the latter must be limited, but there is none to that of boys upsetting things, especially when in large numbers. There is no doubt that the *æsthetic* side appeals to a surprisingly large number of boys: as a boy once said to me, "Half the criticism of college food is due to the way it is presented: it is of course inevitable and unavoidable in the feeding of 500, but it does detract greatly from the enjoyment of one's food, however good it is."

On the question of *variety* we are all agreed. It is another dietetic crime to serve the same dish on the same day of the week. It is not hard to draw up the diet scheme at the beginning of term, and have the boys guessing. Variety applies to combinations of courses, to the extra dishes at breakfast and tea. When soup or fish takes the place of meat, it should never be the same day in successive weeks. Even bread can be presented in different ways, *e.g.* the roll, the twist, the loaf. Variety depends largely on money : *e.g.* chops, cutlets, liver cost much more than rounds of beef or legs of mutton; tomatoes than cabbage.

It is also better at times to sacrifice some nutrition to avoid monotony, and not to give even the good popular dish too often, for a boy's appetite is often capricious and wayward, and there is in my experience considerable *faddiness* and grumbling amongst boys : this is far more often directed against the service than the food. Every boy, of course, criticizes his own school diet more or less, and he often makes the most outrageous statements (*e.g.* disappearance of college cats and rabbit pie) without, shall I say, realising the ofttimes credulity of his parents. I remember a mother dining in my sick house who could hardly realise she was eating normal school food after the tales her son had told her.

It is not improbable that some of this faddiness, which is much more noticeable among the younger boys (the ones who really matter), is due to the prevalent small families with the inevitable spoiling of an only son. Young boys, too, are easily swayed by one or two bigger ones rejecting some dish, often without a trial: it is amazing to see how in this way some new dish can be practically boycotted without a trial unless the situation is handled. The solution with the young boy is not to allow faddiness or let him refuse his victuals, and the passing of any dish should mean an examination by the school doctor with castor-oil in the background.

I have frequently stopped this tendency to unreasonable refusal on my daily visit to Hall, having satisfied myself that the dish is both good and palatable, by offering this alternative, with excellent results on the individual and his neighbours. A little Prussianism at times does no harm, and the school M.O. should be frequently present at meals, as he has more authority than any master on these questions.

Other common causes of food *refusal* are (1) Incipient Illness; (2) Eating between Meals. The latter raises a big question. Should extra food supplied by the boys, and therefore from the parents' pockets, be allowed?

I may say, *en passant*, that so far as I know it is not allowed in girls' schools, but in all big boys' schools with one exception.

Extra food is not *Necessary*, but is on the whole *Expedient*. None of us are, I hope, too old to remember the great joy of personal property: the private pot of jam; the study teas or brews with their eggs and sausages, etc.; the opportunities for social give and take, the laying of the seeds of hospitality and generosity which I have often experienced, the unconscious lessons in the use of money (and is there not some difference between boys and girls in these two last respects ?). Having said so much in its favour, I would lay down the following restrictions :

(1) No food should be brought into school without the house-master's leave : some check must be kept.

(2) Tea is the only official meal at which these extras may be allowed.

(3) No food should be bought except at the school tuck shops, accounts of which appeared recently in one of the daily papers.

(4) These tuck shops should be run by and for the School only. Fruit should always be on sale. Tinned potted meats and fish pastes should not be allowed.

(5) These shops should be open in the afternoon only : here all school M.O.'s are agreed, and no extra feeding should be allowed except at this time.

(6) If possible the amount of money allowed to a boy should be restricted : 30*s*. to £2 is probably none too high an average estimate of what is spent in many schools per head per term on extra food.

If the schools are to blame in some respects, I consider the *Parents* are to blame in this, in allowing so much pocket-money, and also in sending so much extra food. It is unnecessary, it is wasteful and may be harmful, in that it conduces to a too large consumption of pastries and confectionaries, which mean too much carbohydrates and too little of the other constituents; in other words, a loss of balance.

Another point is the relationship between *Meals* and *Exercise*. It has been laid down and generally accepted that one hour should elapse between dinner and exercise : if this means runs and football, I agree. But if other forms of exercise are included, such as fives, squash, gymnastics, cricket nets, tennis, etc., I do *not*.

For twenty-five years I have been looking for ill effects and found none. My predecessor, in a paper written over thirty years ago, could only find one doubtful one—an epileptic fit.

See and hear, year in, year out, as I have, boys ragging and playing the fool directly after meals, and you would realise that intermittent exercise, as these latter games represent, is not harmful after the half-hour interval, and this applies particularly to the younger boy, whose powers of exertion are relatively much less than those of his older brother; and he indeed can play a short childish game of football within three-quarters of an hour without any harmful effect.

Can a boy eat too much?

At home, yes. At school, doubtful.

That he can over-eat at a particular sitting, true: this is readily cured by Nature or a dose of castor-oil; but I can find no evidence in all these years that he can really hurt himself except perhaps in one respect.

Chronic dyspepsia is very rare and never arises in school life: ordinary indigestion is most uncommon, and any stomach-ache is far more likely to be due to Appendicitis than to anything else.

We believe that a healthy boy's heart cannot be damaged by over-strain. Similarly, I believe the healthy boy's stomach is equally tolerant and accommodating: the margin of excess error is far greater at the school age period than later on, and his metabolism far more rapid. We cannot judge a growing boy by our own adult standard.

There is, however, one condition, CONSTIPATION, which is not at all uncommon, and is most probably in part due to food excess, principally the carbohydrates (of which the emasculated varieties are so largely eaten), together with a deficiency of fruits and green vegetables. This condition, plus cases of simple chill due to gastro-intestinal poisoning, of which we see not a few, are also held to be the early symptoms of what Professor Plimmer calls the Deficiency Disease due to insufficient vitamin B, and are an added argument in favour of the flour, fruit, and vegetables I have mentioned frequently.

But taken as a whole, and judging by results, the school diet is a very generous one, and the proof of the pudding is in the eating.

The main test is the general level of good health with a progressive rise in weight.

The average boy or girl up to the age of puberty (this age limit is to me of the utmost importance) should gain weight every term: the rate of increase varies seasonally and varies for the individual, each of whom has his own grade. The scale I use was worked out many years ago by Mr. Cecil Hawkins of Haileybury from a large number of observations, and is divided into twenty grades for each age period from thirteen to eighteen, into one of which every boy can be placed, and under ordinary circumstances he should retain that particular grade throughout his school career. I have found this of the utmost value in assessing a boy's progress, and graphs can easily be made.

For this estimate *weights* must be taken at least twice a term, and should be insisted on in every school. Private schools would find them of the utmost value. It is much better if they are taken in the middle of the term as well, as any commencing loss may be rectified; but if this is not possible, then all the young boys who have lost weight the preceding term, must be weighed three times.

Measurements should be taken under exactly the same conditions *of clothing* and at the *same time of day.*

My experience shows that *Loss of Weight* in the winter and Easter terms is due to (1) coming back too fat, a very common occurrence; (2) illness; (3) fatigue, the result of over-exercise or insufficient sleep; and these are more common causes than food, though the general improvement in this respect since the late War days seems to be associated with an improved dietary, and especially an increase in the fat allowance.

Boys over puberty tend to lose weight much more than those below, due largely to training; generally speaking, it does not matter in them.

In the *Summer* term the percentage of those who show a loss of weight or diminished rise is much higher and is due to the following factors: (1) less sleep always; (2) more fatigue in prolonged exercise on the playing-fields and in the swimming-baths, with much more sweating; (3) distinctly less carbohydrate intake in the shape of bread, potatoes and confectionery generally.

But whatever the time of year, I am never satisfied if a young boy fails to gain weight.

Two other tests of good diet are septic skin diseases and the condition of the teeth. In both of these there has been a marked improvement. Impetigo: first decade 78 cases; last decade 1. Teeth at age of thirteen: thirty years ago; sound, 3 per cent, artificially sound, 18 per cent; average caries, per mouth, 3·8 per cent. Present time: sound, 5·2 per cent, artificially sound, 30 per cent, average caries per mouth, 1·05 per cent. Dr. Friend's figures agree very closely with mine, and do show an improvement, though perhaps not one to be too proud of.

One other point to be remembered is that the physique of the public school boy is, in my opinion, inferior to that of his predecessor thirty years ago; and yet it is my clear experience that the delicate weedy boy of to-day improves vastly in his health during school life, and this is particularly noticeable after two years.

When I look back on the bread-and-butter breakfast and tea, the beer and cheese supper, the monotonous solid dinner of my own school days of forty years ago, a diet which contained some 700 calories less than the present day diet, the improvement has been very great, and this is, I think, particularly true of the girls' schools, whose diet sheets are all better than the boys'.

With this opinion all those schools to whom I have written are in agreement; and indeed leave no doubt on the matter. But all is not perfect, and I have indicated what I consider to be the chief errors and desiderata.

(1) Direct medical supervision in all schools, whether hostel or boarding house, of the diet sheet.

(2) An adequate milk and butter allowance.

(3) Much more fruit: daily should be the ideal.

(4) More vegetables, especially lettuces and salads whenever possible.

(5) Stone-ground flour: a *sine quâ non.*

(6) Less carbohydrates.

(7) A rigid control of the tuck shop, and no other outside food.

(8) A close review of our cooking and service

conditions, which, when all is said and done, are the most open to criticism; and there I would plead for a close and constant collaboration between the bursar, steward and medical officer.

But no advice or talk is of any good unless it is practical and economically feasible, and we must face the economic question: no one in these days can disregard it: certainly not the public schools if the Brighton judgment holds good.

The *Cost of Living* has far outrun any rise in school fees which themselves vary from £130 in a hostel school to nearly £300 in a boarding-house school; and it is quite clear that all schools cannot afford the same generous and varied diet: it is surprising to me that so much is given for so little. Thirty years ago the cost per head per week worked out at 7*s*.: now it is 14*s*. 7*d*., and in another school 13*s*. 8*d*.

Realise that in a school say of 500, an extra ½ oz. of butter a day means over £300 in the school bill; that a chop or cutlet costs about four times as much as a helping of round of beef, liver twice as much; that an apple a day would cost over £600 a year, an extra dish at tea £1250, and that fresh vegetables in spring are ruinously expensive just when they are most needed, and post-war eggs rarely fall below 2½*d*., and school diet is seen to be no easy problem. All the more reason for getting the fullest possible value for our money and improving our service, so as to avoid the chance of such a general parental criticism as that which has formed my text of this paper.

DISORDERS OF DIGESTION DURING SCHOOL LIFE

By W. Soltau Fenwick, M.D.

The period of school life coincides with many important phases of development. The transition from the infantile to the adolescent system of digestion is sometimes unduly prolonged, so that the intestine remains for several years not only the most active but also the most susceptible partner in the digestive combine. The rapid growth of the body that occurs during this time throws considerable stress upon the organs of assimilation, and thereby exposes any inherent weakness they may possess, with the result that neglect of the general health or an injudicious dietary may inflict much damage upon the stomach and bowel. Childhood is also a most impressionable age, and many of the acquired idiosyncrasies which exert a deleterious influence upon the ultimate health of the individual are the result of unwise teaching in the nursery or the schoolroom. The digestive organs themselves are also readily educable, and the large intestine is particularly apt to contract bad habits which engender constipation and other troubles in later life. Another constant source of danger arises from the incidence of various infectious diseases, many of which not only induce inflammation of the digestive tract, but expose the weakened tissues to the risks that attend over-feeding with liquid nourishment. Finally, that intricate combination of physiological processes comprehended in the term "puberty" always exerts an important influence upon the digestive viscera, and not infrequently brings into prominence certain congenital lesions of their structure, the symptoms of which previously had remained in abeyance; while at all times such diseases as appendicitis, abdominal tuberculosis, ulceration of the large bowel or perforating ulcer of the stomach may suddenly attack a child apparently in good health and cause imminent peril to life. The fact that nearly 18 per cent. of all sufferers from indigestion at middle age ascribe the commencement of their complaint to their school life is a sufficient excuse for the following brief survey of this important subject.

Appetite and Idiosyncrasies.—Many children carry with them to school a strong dislike to certain forms of food, engendered either by the monotony of nursery meals or by over-indulgence on the part of parents or nurses, and may express the utmost distaste for such articles as porridge, bacon, fish, eggs, treacle and milk or suet puddings; but, as a rule, these fancies soon disappear and the child learns to eat and enjoy the mixed dietary suitable to its age. All dietetic aversions, however, are not due to faulty education, and those who assume that a child must have been spoilt at home if it will not eat everything supplied to it, are liable to overlook one of the most important causes of want of appetite and indigestion in early life, namely, food-idiosyncrasy. Eggs are a veritable poison to many individuals, and even a small portion of the "white" may produce violent abdominal pain, vomiting, swelling of the face and even dangerous collapse. Among farinaceous foods, oatmeal is most prone to disagree, and however carefully porridge is prepared, those who are unable to digest it suffer from abdominal distension, palpitation of the heart, breathlessness, excessive yawning, giddiness or nettlerash. The best example of fish idiosyncrasy is mackerel, which is apt to induce severe toxic symptoms, accompanied perhaps by puffiness of the face, swelling of the scalp or by a diffuse nettlerash; but some people are unable to partake of sole, plaice, whiting or salmon without indigestion. All shell-fish are liable to prove injurious, especially mussels; shrimps and prawns occasionally give rise to vomiting and diarrhœa, and those individuals who possess an idiosyncrasy with regard to crab may not only develop acute gastro-intestinal inflammation, but exhibit mysterious bouts of fever. Milk is a great difficulty with many people throughout life, and the repugnance evinced to it may vary from mere dislike of its taste or appearance to an active intolerance, characterised by gastric discomfort, vomiting, headache and constipation. This idiosyncrasy embraces all varieties of milk, fresh, boiled, sterilised, dried and preserved, and may even extend to its use in tea, puddings, custards or junket. It is an extremely embarrassing peculiarity to possess, as it renders a child very difficult to feed and greatly increases the danger of any illness in which the nutrition of the patient is of vital importance. Every variety of fruit and vegetable is liable to disagree with some people, especially pears, oranges, apples, strawberries, lettuce, beetroot and spring onions. Among animal foods, exception is sometimes taken to chicken, veal, rabbit, game, liver and kidney on account of pain or other unpleasant results of their maldigestion, while the members of a family prone to phthisis usually exhibit an intense dislike to meat-fat, oils, and sometimes to sugar. So numerous are these natural idiosyncrasies, and so often are they overlooked, that whenever a healthy child suffers from periodic attacks of indigestion, sickness, diarrhœa or nettlerash, attention should at once be directed to the food consumed on the day of the attack or on that immediately preceding it.

It is to be hoped that the recent legislation concerning the use of preservatives in food will prevent much of the trouble that has hitherto ensued from this unnecessary danger. Many people are peculiarly susceptible to the action of "preservatives" unwittingly consumed in ordinary food, boracic acid being liable to produce nettlerash, the salts of copper, inflammation of the bowel, and formalin, severe gastritis.

Want of Appetite.—Much stress is laid upon the benefits of a bracing climate, and the location of a school at the sea-side or at an elevation of several hundred feet is usually regarded as synonymous with good health and a hearty appetite. Unfortunately, climate varies almost as greatly as food in its effects upon different individuals, and a place which agrees with the majority of children may disagree profoundly with others. A northerly aspect, even in the absence of cold winds, is apt to destroy appetite for the later meals of the day, and sometimes seems to render fats difficult of digestion and to induce nausea. It also shares with high altitudes a tendency to induce sleeplessness. Other children lose their desire for food when the school is situated in a low-lying district near a river, in a moist, enervating climate or on a bleak tract of land exposed to high winds. Certain popular resorts on the south coast have always enjoyed an unenviable reputation for "liverishness," and some children are affected by frequent bilious attacks when sent to school at these places. Sometimes the water supply is chiefly to blame, and the "chalky," "iron" or "peaty" waters met with in different districts, although quite harmless to the majority, cause certain individuals to suffer from flatulence, constipation or loss of appetite. Want of appetite in the early morning, or actual repugnance to breakfast, may arise from many causes, such as milk or lemonade taken at bedtime, overheating of the house or bedroom, or drinking cold water on rising from bed; but the most important is congenital in origin and is chiefly met with in girls. These children exhibit the greatest dislike to food in the early morning and can never be persuaded to eat more than a scrap of bread-and-butter even when, as sometimes happens, they are punished for their refusal. In such cases there is often a downward displacement of the stomach which permits a little bile to regurgitate into the organ during the night. This excites repugnance to food until the erect posture allows it to dribble back into the intestine. When the amount of bile is considerable, intense nausea, giddiness and vomiting ensue every morning on rising from bed. The condition is aggravated by indulgence in milk, eggs and sweets and by deficient physical exercise, and may often be ameliorated by the use of an elastic belt. Fanciful or *pernicious appetites* include an excessive desire for substances which the majority of people only take in strict moderation or which possess no nutritive value. Thus, some children evince a passion for lemons or other sour fruits, vinegar, pickles, raw turnips, nuts, and even for egg-shells, large quantities of which are sometimes devoured without apparent detriment. On the other hand, " Salt Fiends " who devour the contents of the salt-cellars at every meal, and take every opportunity of stealing common salt to satisfy their peculiar infatuation for it, are very apt to develop dropsy and anæmia which closely resemble the effects of kidney disease; while those who habitually suck their hair, or chew pieces of cotton or thread, are apt to suffer from the formation of " hair-balls " in the stomach and intestine, which produce chronic indigestion and may terminate in fatal hæmorrhage or perforation of these organs.

Insomnia and Dreams.—Mention has already been made of the fact that some children cannot sleep at a high altitude or at certain seaside resorts; but as a rule this insomnia is only temporary and disappears after a few weeks. Disturbed sleep due to bad dreams or " nightmares " is a common result of indigestion, and usually ensues from indulgence in indigestible food at bedtime. Children who are liable to bilious attacks can seldom tolerate milk at night, while others are easily upset by cheese, radishes or cold meat at supper. Talking in the sleep and grinding the teeth are often supposed to be indicative of round-worms, and in nervous children irritation of the bowel from this cause may undoubtedly excite such phenomena. Far more important, however, are the effects of thread-worms. These descend to the rectum when the child's body becomes quiescent in a warm bed, and by their incessant wriggling and burrowing in the mucous surface of the bowel just inside the anal aperture excite the most distressing irritation, which may prevent sleep for many hours each night. Nocturnal incontinence of urine is sometimes the result of this unsuspected nuisance, as also is masturbation in both sexes. With regard to dreams, which may be so terrifying as to induce fits of screaming, it is interesting to note that nightmares due to indigestion frequently concern imaginary attacks by cats or bears, or murderous assaults with knives, while children affected with "short sight," not corrected by glasses, more often experience the terrors of falling from a height.

"Tricks" and "Habits."—So many peculiar habits are acquired by imitation, that "tricks" of all kinds are regarded by those in authority as either wilful or due to lack of proper self-control. Constant sighing or yawning in class is particularly annoying to a teacher, who naturally considers it an expression of boredom or inattention; and a child who appears somnolent in school and unable to grasp what it is taught is unhesitatingly stigmatised as indolent or intensely stupid. In many cases, however, such manifestations are in reality beyond control. Owing either to a food idiosyncrasy or to maldigestion of the last meal, poisons are generated in the stomach which, by absorption into the general circulation, exert a specific influence upon the higher centres of the brain or upon the respiratory centre in the medulla oblongata. In the former case, extreme drowsiness, inability to concentrate the attention upon the subject in hand, loss of memory or mental confusion develops soon after the midday meal and persists for some time, while in the latter a series of deep sighs, incessant yawning or frequent short, barking coughs are the usual expressions of the respiratory disturbance. Less frequently, asthmatic symptoms make their appearance or uncontrollable hiccough persists for an hour or longer. Somnolence and yawning are particularly apt to occur on those days when pea-soup, custard or suet pudding has been supplied at the midday meal to a sufferer from indigestion or food-idiosyncrasy, while hiccough and "stomach-cough" are more often the result of hasty eating or drinking, or indulgence in violent exercise after the consumption of such articles as ginger-beer, beetroot or nuts. Tickling the mucous membrane of the nose with a feather or a twist of paper will often stop both these conditions. Recurrent hiccough; independent of food, is not uncommon in young people suffering from round-worms. Another annoying expression of indigestion, or "autointoxication" as it is often called, is flushing of the face and ears, buzzing in the head, giddiness, palpitation of the heart, and in young children intense irritation of the nose and eyes, which causes them violently to rub these parts; or itching of different parts of the body occasions restlessness, fidgeting, twitching of the muscles of the eyes, blinking of the eyes and other contortions which are extremely annoying to onlookers. A very distressing symptom, sometimes met with in girls after puberty, is a loud gurgling or splashing in the abdomen, which recurs about an hour after a full meal and synchronises with inspiration. As it is always intensified by movements of the body and by such respiratory acts as coughing, sneezing or laughing, it is usually regarded as "deliberate" or "hysterical." It depends upon a congenital misplacement of the stomach, which occupies a vertical position under the left wing of the diaphragm, every movement of which tends to shake the flaccid organ filled with a mixture of gas and liquid and thus to cause an audible splashing of its contents. There is always a strong element of neurosis in chronic cases of this kind which renders them most difficult of cure.

The Causation and Varieties of Indigestion.—Digestion is said to "wait upon appetite," and it is quite certain that when food is taken under compulsion it rarely undergoes perfect digestion. It is, therefore, more wasteful to make a child eat what it does not want than to risk the food being eaten by those for whom it was not intended or even to throw it away. One of the commonest causes of indigestion in early life is exposure to cold, which excites a catarrhal inflammation of the alimentary tract, with vomiting, diarrhœa and often a rise of temperature. Getting wet during a game or a walk, without changing the clothes, is a frequent source of these febrile attacks, one of which predisposes to another; while in some people an ordinary cold in the head is invariably followed by a spread of the catarrh of the stomach and bowel. Immersion of the body in cold water, whether fresh or salt, is apt to induce a similar though more transient condition, and the victims of a congenital misplacement of the stomach and intestine, known as "visceroptosis," may remain cold and blue for hours after a cold bath or suffer from exhaustion, loss of appetite and perhaps from vomiting. This statement applies with even greater force to the statutory "cold tub" before breakfast, which is only good for those with whom it agrees. Quite apart from this question, few people are at the best before breakfast, when the stomach has been fasting for about twelve hours, and consequently early school for fasting children, although perhaps excellent from a disciplinary point of view, is of limited value as an intellectual exercise, for it is doubtful whether lessons before the first meal of the day are ever properly understood or memorised. Some form of food, such as milk, cocoa or biscuits, should therefore always be supplied to children who are expected to work before breakfast. The habit of reading at meal-times, although chiefly a practice of later life, should never be encouraged, as it is very apt to induce maldigestion of the food, since the brain and the stomach both require a full supply of blood and, therefore, seldom attain a high degree of functional activity at the same time. Regular exercise is essential to the preservation of good digestion, but physical fatigue impairs the appetite and retards the solution and absorption of food. Nervous influences exert an even more powerful effect by paralysing for a time both the secretory and the motor powers of the stomach, while corporal punishment, anxiety, a fit of temper or even an unpleasant sight or smell will, in certain individuals, occasion an attack of dyspepsia or diarrhœa. In rare instances a transient attack of jaundice is invariably caused by a mental shock or by the worry of an examination. The hygiene of the mouth is always a matter of considerable importance, and children should not only be made to cleanse the teeth morning and evening, but should consult a dentist at regular intervals. Adenoids or enlargement of the tonsils sometimes cause retching before breakfast, either on account of the unhealthy secretions swallowed during the night or by reason of the straining cough which these conditions are apt to excite. Lastly, it is worthy of notice that acute symptoms apparently referable to the digestive organs may ensue from such unsuspected causes as diving, high jumping, exercise on the horizontal bar, a railway or motor journey, the sucking of gum or liquorice, surreptitious indulgence in tobacco, a severe thunderstorm, or even the smell of paint, all of which may be followed by headache, giddiness, vomiting or diarrhœa in young people who possess an undue susceptibility to them.

The Symptoms of Indigestion.—It cannot be too strongly insisted upon that any complaint of illness by a child at school should receive immediate and careful medical attention. If this axiom applies to every simple disorder of the health it becomes infinitely more important in acute abdominal complaints, many of which are extremely dangerous. A pill or a dose of castor-oil is an excellent household remedy for many of the minor ills of life, but their routine administration in all cases of abdominal pain is fraught with great danger, and the efforts of even the most skilful surgeon may be defeated by an injudicious administration of aperients. No matron or nurse should ever be permitted to treat abdominal cases on her own responsibility, but should merely put the patient to bed and at once call in the doctor attached to the school. In all cases of illness the parents or guardian should immediately be advised as to its nature, so that arrangements may be concerted if necessary for the calling in of a specialist or surgeon. When a doctor is able to see the case at its onset there will rarely be a valid excuse for the performance of an operation on a child at school before the parents have been informed of its probable necessity.

Abdominal pain is always a symptom of great importance. In young people it usually arises either from intestinal spasm (colic) due to exposure to cold, or to some toxic poison taken by the mouth, or to inflammation of the peritoneal covering of the bowel. In the former case, the pain recurs at short intervals, is griping or twisting in character, referred to the centre of the abdomen and often relieved by pressure or rubbing with the hand. Acute peritonitis in early life is almost always due to appendicitis, and the pain is felt at first in the upper part of the abdomen, whence it radiates towards the right hip and is always accompanied by great tenderness to pressure. The temperature is usually elevated, and there may be vomiting and constipation, but not infrequently diarrhœa is an early symptom and may distract attention from the real nature of the complaint. It is in these cases that the routine administration of aperients is so dangerous, since the agitation of the intestine which they induce tends to spread the area of inflammation. Appendicitis, however, is often much more insidious and takes the form of attacks of pain, which recur at intervals without apparent cause or any notable rise of temperature. This variety of the disease is very common during school life, and far from being regarded seriously, is often referred to as one of So-and-So's "attacks," and attributed to over-eating. Nevertheless it gradually leads to a marked deterioration of the general health, irritability of temper, disinclination to exertion, discomfort after meals, loss of flesh, and eventually to organic disease of the digestive canal. Until about sixteen years of age, the intestine is much more susceptible to disease than the stomach, and consequently when pain develops immediately after food it is usually due to spasm of the large intestine and is apt to be followed by diarrhœa. Hot food and liquids are especially liable to give rise to these symptoms, and in many instances the intestine acquires such an extreme degree of irritability that for many years exposure to cold or even a strong emotion, such as anxiety or fear, will at once induce colic and the desire to evacuate the bowels. Sharp attacks of colic, recurring at irregular intervals and independently of food, are not infrequent in children who have suffered from tuberculous disease of the abdominal lymphatic glands. An extremely dangerous, though happily rare form of inflammation of the large intestine, is apt to follow the drinking of water from streams, ponds or dykes at picnics, or when thirst is felt after exercise in the country. The infection of the bowel from this cause rapidly proceeds to ulceration and few children survive more than a few weeks. There should, therefore, be a most stringent rule in every school that no water be drunk outside its premises without special permission, and it would be a safe plan to place the same embargo upon milk. Anæmic girls after about fifteen years of age occasionally suffer from acute ulceration of the stomach, which may give rise to sudden and unexpected hæmorrhage, the latter being not infrequent in those who have lately suffered from boils. Pain occurring soon after a meal containing solid food should always be regarded seriously until its causation has been established, and insistence upon rest, with a milk diet and avoidance of purgatives, is always a safe even if an irksome precaution. Perforation of the stomach from acute ulcer is by no means unknown during school life, and unless immediately recognised and treated is a fatal accident. Severe abdominal pain, increased by breathing and coughing, is sometimes the first indication of pleurisy over the base of a lung.

Vomiting.—This symptom is very common in early life, but its importance varies with its causation. The so-called "bilious attacks" are due to acute catarrhal inflammation of the stomach, and ensue from indulgence in certain articles of food towards which the child possesses an idiosyncrasy. All other varieties of gastritis are also associated with sickness, and perhaps with diarrhœa, and consequently repeated retching and vomiting often constitute the initial phenomena of such acute febrile diseases as scarlatina, mumps, measles, chicken-pox and influenza. Nervous children are very apt to be sick if they are frightened or hurt, and many of the "fainting attacks" attributed to a weak heart are due to the sudden nausea and giddiness which immediately precede a copious emesis. Retching or vomiting before breakfast is usually excited by cough; the expiratory efforts demanded for the dislodgment of thick mucus from the back of the nose or throat being sufficient to cause the mechanical emptying of the stomach. This variety is therefore common in children affected with adenoids and disease of the tonsils, and is an almost invariable result of a severe paroxysm in whooping-cough. An early morning cough which excites retching is also one of the earliest indications of phthisis. There are two varieties of vomiting immediately after meals. In rare instances, it is due to a tumour of the brain and is associated with headache, disturbance of vision and other symptoms which suggest a cerebral origin. Girls after puberty sometimes exhibit another form of sickness after food which is extremely troublesome to treat and often creates much difficulty of diagnosis. At the end of a meal, or even after only a few mouthfuls have been swallowed, she hurriedly leaves the room in order to vomit, but, nevertheless, will sometimes return to finish the meal or ask for food soon afterwards. This unpleasant symptom may occur after every meal; but although the girl is somewhat anæmic and lethargic, she does not experience any pain in the stomach nor does she lose weight, because only a portion of the meal is usually ejected. The condition is of nervous origin and is not an indication of organic disease. *Periodic attacks of vomiting* are also far more frequent in girls than boys and are usually preceded by severe headache. The retching lasts several hours, and the fact that the mucus which is ejected is coloured with bile causes the attacks to be regarded as "bilious." They are, however, a variety of migraine and occur almost exclusively in subjects of congenital misplacement of the stomach and bowel. They are usually brought on by excitement, fatigue, travelling, watching moving objects at a cinema or theatre, or are a prelude to the catamenia. Sometimes the attacks are replaced by violent giddiness.

Flatulence comparable to that met with in adult life is rare in the young, and is almost invariably the result of disordered action of the bowel. Periodic distension of the abdomen, which necessitates loosening of the clothing and occasions acute discomfort, is always suggestive of latent disease of the appendix.

Constipation.—The digestive organs are liable to contract bad habits which are very difficult to eradicate, and this remark applies especially to the large bowel, which is easily taught to become indolent and fail to empty itself each day. This habit of constipation is usually acquired during school life, either from carelessness or ignorance, and leads to lifelong trouble. The intestine, which, like other organs of the body, becomes comparatively quiescent during sleep, begins to awake to renewed activity about five o'clock in the morning, and displays a greater susceptibility to stimuli between this hour and breakfast than at any other time of the day. It is for this reason that the subjects of chronic diarrhœa usually begin their daily trouble in the early morning, and that salines and castor-oil taken before breakfast act so quickly and efficiently. The entrance of food into the fasting stomach also causes a sympathetic contraction of the large bowel, so that healthy people usually desire to secure an evacuation soon after the first meal of the day. It is, therefore, most important that children be taught to encourage the bowels to act after breakfast and to allow plenty of time for the purpose. Ample lavatory accommodation should be provided at every school, and any attempt to avoid a daily evacuation of the bowels should be treated just as severely as any other offence against discipline. It is a good plan at preparatory schools to have a list of the scholars' names affixed to the main door of the lavatory, and make every individual indicate upon it each day whether the bowels have acted or not; the list being inspected in the evening, and those cases of constipation inquired into and treated if necessary. When the large intestine fails to empty itself at regular intervals, the activities of the stomach and other digestive organs become embarrassed, and flatulent distension, with loss of appetite and other unpleasant symptoms, develop. The stagnant contents of the bowel gradually undergo decomposition, with the formation of organic poisons, which set up inflammation of its mucous surface, with an extension in many cases into the appendix. Absorption of the poisons into the general circulation seriously affects the composition of the blood, and through that medium almost every organ of the body. Anæmia, accompanied by debility, breathlessness and palpitation, almost invariably develops, and the skin is often greasy, malodorous and liable to boils or other eruptions. The scalp is dry and scurfy, the hair loses its curl and colour, or falls out, while pyorrhœa is by no means infrequent. In the course of time the functions of the liver and other important organs become deranged, and in severe cases permanent ill health ensues. Those who do not suffer from the complaint are apt to regard it as a mere trivial annoyance, whereas, in fact, it is a serious disorder which often induces conditions fatal to life. If these facts were taught in schools as an adjunct to some of the other Nature Studies so dear to the hearts of modern educationalists, preventive medicine would receive a valuable stimulus and an infinity of human suffering might be prevented. When the water supply of a school contains an excess of lime salts, measures should be taken to diminish its constipating effect; wholemeal bread should be supplied instead of the usual white variety, fruit and green vegetables should figure largely in the dietary, and some mild aperient should be administered, under medical supervision, when necessary.

The Influence of Digestive Disorders in Childhood upon the Health of the Adult.—Chronic diarrhœa in infancy, due to the administration of unsuitable foods, gives rise to progressive emaciation and is attended by a high mortality. The children who recover from this serious disease remain for many years thin, anæmic and stunted in stature, and are not only liable to attacks of indigestion or diarrhœa from comparatively slight causes, but exhibit a poor resistance toward infectious and other intercurrent complaints. Even after the body has completed its growth, there often persists a tendency to nervous exhaustion, associated with considerable enfeeblement of the organs of digestion and assimilation, characterised by an indifferent appetite, discomfort and distension after meals, and a difficulty of digestion of liquid nourishment, green vegetables and fruit. The cause of this impairment of function is to be found in the destruction of certain areas of the mucous membrane of the alimentary tract wrought by the original disease of infancy, which persists throughout life and is readily discernible upon microscopical examination of the tissues. Among the complaints contracted during school life, chronic appendicitis and constipation are the most important. The former frequently terminates in an attack of acute inflammation, which unless promptly treated often terminates in gangrene or by the formation of an abscess, and at all times exerts a most prejudicial effect upon the general health. Chronic colitis, with its attendant evils, is a common expression of latent appendicitis, while in many instances an excess of gastric secretion leads to the formation of ulcer in the stomach or duodenum, and in some cases to gall-stones. The immediate consequences of chronic constipation have already been noticed, and it only remains to observe that the colitis which ensues from stagnation and decomposition of the intestinal contents is apt to set up inflammation of the appendix, fæcal obstruction of the bowel, and probably predisposes to the incidence of cancerous growths. The congenital variety of visceroptosis, which chiefly affects the stomach, large bowel and right kidney, is unduly frequent in girls, although its characteristic symptoms seldom develop before puberty. A large proportion of the subjects of this displacement of the abdominal organs suffer from severe migrainous headaches, often accompanied by vomiting, and then popularly known as "sick headaches," which occur just prior to the catamenial periods and constitute quite a serious illness every month. In other cases the chief cause of complaint is neurasthenia or "nervous exhaustion," which persists with varying intensity for many years; while in about two-thirds of all cases attacks of abdominal pain, indigestion and constipation complicate one of the afore-mentioned features of the complaint.

THE INCIDENCE OF INFECTIOUS DISEASES IN PUBLIC SCHOOLS

By C. E. Shelly, M.D., M.R.C.P.

Any paper on this subject must necessarily include a grateful reference to the work which has been continuously carried out by the members of the Medical Officers of Schools Association ever since its foundation by the late Dr. Alder Smith and Surgeon-General Evett more than forty years ago.

The first step taken by the Association was to draw up " A Code of Rules for the Prevention of Infectious and Contagious Diseases in School." This was intended for the use of parents and for the Medical Officers of schools at large, and its successive editions have secured a ready and wide appreciation.

But the hygienic aspect of a residential school bristles with problems on every side, and seems to call urgently for further research and to promise rich results to the patient investigator in every direction; and it invites research because of the peculiar conditions which characterise its subject.

Every residential school, large or small, is a more or less isolated community; and in connection with each there confronts the sanitarian the same array of problems which claim his consideration alike in the teeming city and the scattered hamlet. With these, so numerous and so widely recognised, I do not venture to deal. But of the other special aspects of the school I would allude to one or two of particular interest.

The peculiar feature—and from the hygienic point of view the most important feature—of a school lies in the fact that it is a closely aggregated collection of young and immature members of the race, specially susceptible to illness, and peculiarly so to the commoner infectious maladies.

Although in some senses it occupies an isolated position for about eight months out of every twelve, the school has numerous points of contact with the world around it: each of these may, at any moment, become an avenue of infection; and although none can be absolutely safeguarded, all of them may be intelligently watched. Are we familiar with any other combination of circumstances which can furnish, under conditions so nearly constant and consistent, and in relation to material so immediately under observation and control, the data needed for investigating some of the most interesting problems of preventive medicine?

For instance, the school age is pre-eminently that during which the common infectious exanthemata are wont to be developed. But it is only comparatively recently that we have begun systematically to collect and compare the important material and observation which had hitherto so largely run to waste.

It is true that, owing to carefully conducted inquiries by the Medical Officers of Schools Association, we have come more accurately to define the incubation periods and the infective duration of several maladies; but that is only one of the problems confronting us; and there remained others, fully as important, clamouring for solution. Even Dr. Clement Dukes—that great pioneer of School Hygiene—lacked both time and material for dealing with them: they persisted—to be handed down to his successors, who owe so much to his inspiring example, to take in hand.

The susceptibility of the individual schoolboy or schoolgirl to the commoner maladies of their age depends upon whether he or she has already secured immunity by a previous attack of the self-protecting disease in question; but the *liability of the school* to an epidemic outbreak of that malady is closely related to the *proportion* of susceptible individuals present in its midst at the time when infection is introduced. The late Sir George Turner established the relationship of scarlatina epidemics amongst the general community and the density of the population concerned, several years ago; and it was subsequently confirmed by Sir George Buchanan.

The idea suggested itself that a careful examination of the medical records of the large residential schools—covering as wide an area as possible—thoroughly digested, collated under pertinent headings and appropriately tabulated, might possibly yield valuable and useful information upon more than one important question. The scheme was an ambitious one: it would involve a considerable expenditure of time and labour: it might, or it might not, furnish prizes worth the winning—or at least show the way in that direction. It was scarcely possible that it would prove wholly fruitless.

A questionnaire was drawn up with a number of headings under which information was required, and a copy of this was sent to each of the Medical Officers of all the public and of the larger residential schools, some thirty in number altogether. My sincere thanks are due to my colleagues—on whose leisure and labour I had made no small call—for the valuable information with which they furnished me.

Meanwhile, I began studying the records of my own school for the first twenty-four years of its existence, starting from the day on which it opened—with 40 boys and no books. This meant tracing the medical history of every boy (nearly 2,600 in all) day by day for each term from his entrance onward, throughout each term—and during the holidays as reported by his parents.

The total results—in regard to such boys as entered *un*protected by a previous attack of the principal infectious diseases—are shown in Table I, A, as under:

TABLE I, A

Statistics for Boys entered	Sixteen years, 1863–79 1,639	Eight years. 1879–87 959	Twenty-four years, 1863–87 2,598
*Un*protected from :—			
Variola (Small Pox)	1,624, or 99·08%	955, or 99·5%	2,579, or 99·2%
(Scarlatina)	1,183, or 72·18%	718, or 74·86%	1,901, or 73·57%
Morbilli (Measles)	382, or 23·3%	283, or 29·5%	665, or 25·79%
Pertussis (Whooping Cough)	448, or 27·3%	285, or 29·7%	733, or 28·02%

Dividing the twenty-four years into three periods of eight years each, but little difference was observable between the returns for the first and second of these epochs; and the combined returns for the first sixteen years, 1863–79, are grouped together in Column I. In several points this column contrasts with that for the last period of eight years, 1879–87, shown in Column II.

Thus it will be noticed that the percentage of *un*protected is decidedly increased in the latter period. Moreover, as this increase of the unprotected obtains in the case of each and all of the maladies enumerated, one is impelled to the conclusion that it is really due to an increasing education of the public in general hygiene, so that during the pre-school age fewer children contract these maladies than was formerly the case; and a greater number, therefore, enter school unprotected. This result may be highly encouraging to the Medical Officer of Health and to the family doctor; but it does not lessen the responsibilities or the anxieties of the Medical Officers of schools.

This progressive increase in the proportion of the unprotected at the beginning of school life is evident elsewhere and in other ways. Thus, *e.g.* in a school of 350 *young* boys, the entrance age was some years since raised by twelve months; but the average ratio of the unprotected (as from measles, *e.g.*) now stands practically at the same figure as formerly—and this in spite of the fact that twelve months of age, more or less, makes a very notable difference in the "susceptibility" returns for any yearly period between the ages of nine and twelve.

Take *Small-pox* again:—it is noticeable that between 1863 and 1879, out of 1,639 boys no less than 15, or 0·9 per cent., of boys aged about 13 to 13½ had already had this disease: whereas between 1879 and 1887, only 4 boys, or 0·41 per cent., had similarly suffered. A previous attack of small-pox is stated (Guy and Harley) to afford somewhat greater protection against the disease than does vaccination; although vaccination confers the greater protection against a fatal issue. It is notorious that a single primary vaccination (as at birth) confers an immunity the duration of which varies immensely in different individuals; and it is certain that its protective influence is apt to be quickly exhausted during the actively metabolic period of adolescence. Hence the necessity for insisting on the re-vaccination of every boy previous to or on his first entering the residential school: more than 70 per cent. of these vaccinations are successful.

But we must not lose sight of the fact long since pointed out by the late Sir George Paget, viz. that a convalescent from typhoid fever is almost always susceptible to vaccination—that its previously protective action has, in fact, been destroyed by the more

TABLE I, B.—EPIDEMICS

SCARLATINA.

Number attacked .	[illegible]	1	5	9	5	3	23*	1	1	15†	7	2
Number in school . .	300	300	300	326	362	359	357	353	352	356	354	495
Percentage .	0·3	0·3	1·6	2·7	1·3	1·83	6·0	0·28	0·28	4·3	2·0	0·4

(*Percentages.*)

GERMAN MEASLES .		2·5	0·26	0·82	3·1	4·10	5·74	3·08	22·6	17·6		
MUMPS . .		1·6	4·1	9·8	2·24	6·26	3·6	4·6	18·2‡	2·8	4·8	
WHOOPING COUGH . .	From 1·3 to 2 per cent. of total boys in school.											
CHICKEN-POX	0·82	1·6	1·36	2·1	1·25	3·1	3·08	0·52	0·6	3·8	1·0	

MEASLES.

Number attacked .	52	25	33	14	35	47	58	71	77			
Number in school . .	316	358	359	359	363	359	498	496	496			
Proportion .	$\frac{1}{6}$	$\frac{1}{14}$	$\frac{1}{10}$	$\frac{1}{26}$	$\frac{1}{10}$	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{7}$	$\frac{1}{6}$			
Percentage .	16·4	7·0	9·2	3·9	9·3	13·1	11·7	14·3	15·7			

* Special cause active at the time. † Ambulant "desquamator."

‡ Began during measles epidemic of 1883 and ran concurrently with it.

[Read in conjunction with text: the table shows the number of pupils attacked in each successive epidemic (out of so many pupils in the school at the time—equalling such and such a percentage in each case). Next the percentage of those attacked in the several outbreaks of 5 other maladies—and, finally, similar particulars in regard to outbreaks of measles only.]

recent disease. While it is true that typhoid, as we used to meet with it, is now comparatively rare as a school disease, I am far from feeling assured that the various types of " paratyphoid " disease, which show themselves in its place from time to time, are not attended by what we might term a similar " de-vaccinating " effect.

The near equality of the returns for *Pertussis* (whooping-cough) and for *Measles* (Morbilli) is striking for all periods, and it is very equably maintained throughout each of the twenty-four years noted. I think that, for this age at all events (13–14 *circ.*) the statistics of one may serve as a useful means of checking returns made under the head of the other malady.

Fully 25 per cent. entered *un*protected by any previous attack of *Measles*. Epidemics of measles are common and often extensive, *vide* Table I, B, measles; and Table II. I shall have more to say on these points presently.

So far we have been considering the statistics of the one school which I have known longest and best. We have not considered these beyond the point reached in 1887. I have the subsequent returns, enumerated under all headings, up to the present time; but these I am not going to inflict upon my reader, because, decade by decade, they tell a story practically identical with their predecessors—except that, decade by decade, the proportion of *un*protected entrants continues to rise, slowly but steadily, under all headings.

In regard to such figures as I am now about to deal with, you will understand that they are based upon an analysis of *all* the returns furnished by a total of nearly thirty of the largest boys' schools in the country. It happens that the records of my own school are the most detailed and complete—though not, I think, more conclusive than the others; but I will undertake that the results which a study of all have furnished, have been arrived at by meticulous care, and represent the outcome of actual figures impartially considered.

Hitherto I have referred to his age at entrance as largely influencing the schoolboy's susceptibility to infection; but there is another factor, even more potent in its operation; for lack of a more suitable term, one must dub it the Social factor. The relative effect of both these factors is illustrated in Table II, in which thirteen large public and private schools are arranged in the order of the age of the boys at entrance.

TABLE II

School.	Average age at entrance.	Percentage of boys who enter unprotected by:—					
		Scarlatina.	Morbilli.	Rubella.	Mumps.	Pertussis.	Varicella.
A	8–10	82·3	33·1	94·7	85·2	41·8	58·6
B	10½	80	65	80	60	30	40
C	1	70*	45*	70*	70*	33*	50*
D	11½	?	?	?	?	?	?
E	9–14	75·9	27·8	?	74	42·7	?
F	12	?	?	?	75·9	42·7	?
G	12	?	?	?	?	?	?
H	13	67	19	?	?	31	?
I	13	?	?				?
K	13	?	?	?	?	?	?
L	13½	80	24	?	?	32	
M	13½	74·86	29·5	?	?	29·7	?
N	14½	75	16·9†	96·9	72·6	43·4	55·1
O	19	8	3	10	10	15	10

* Approximate returns. † Boys come chiefly from other large schools.

Parallel with the rise in the age of entrance will be noted a pretty constant increase in the ratio of the protected. But modifying the all-important factor of age is to be noted the potent operation of social position.

Contrast, for instance, A and B: the former is a most excellent school which, in virtue of the very terms of its existence, is largely recruited from families that have been visited by misfortune or broken up by disease and death. Boys come to it, therefore, at the age of about nine, from conditions which have been, on the whole, *not* those most favourable to the safeguarding and preservation of health. No infectious malady is more apt to spread under such circumstances than is *Measles*; and the percentage of those already attacked by that disease is sixty-seven.

B is a private boarding-school: its boys come from families in a good position in life—living in large, many-roomed houses in sunny and airy positions, with facilities for the prompt and effective isolation of any case of illness. Every care is possible, and is doubtless given, to the children individually at home; and these enter the school direct without having passed through any preparatory school. Hence, although the entrance age is at least eighteen months above that of A—and probably equal to that of E—only thirty-five out of every hundred have been "salted" by such a disease as measles.

Putting this exceptional contrast aside, all the schools are on a fairly equal footing as regards social status. And it will be seen that, so far as their statistics are available and reliable, *age* affords a very fair general basis for estimating the liability to infection by the several diseases mentioned. A similar tabulation, much more full and detailed, made out several decades later, fully supports the foregoing statement.

For O the entrance age is nineteen years: its figures show how searchingly and widely measles works during early adolescence; and shows, too, how many adults have already suffered from scarlatina—though of boys *æt.* fifteen less than 50 per cent. have had the disease.

It appears that the great majority of boys in a large school tend to get through the list of ordinary self-protecting infectious ailments by the age of about fifteen years. The chief exception would appear to be scarlatina.

Measles seems to be very strongly self-protecting up to the age of twelve or thirteen years at least. I have not been able to learn of a genuine second attack in a child under twelve.

I will ask you to follow me a little further in probing the mysteries attending measles. This disease is selected because it not only furnishes large epidemics in schools, with a corresponding dislocation of the school routine, etc., but also because of the fact that it is infectious during its incubation period; so that a lad incubating measles in his own person may—for a full week or more, without any obvious sign of ill-health—continue to go about all this time infecting susceptible individuals with whom he is associating. The Medical Officer of the school would be grateful for any timely warning of an epidemic; and would also welcome any approximate indication of the numerical extent of the outbreak which he may have to face. Both these are now obtainable as regards not only measles, but most other of the commoner infections as well.

As regards his liability to infection, every boy who enters the school *un*protected by a previous attack of one of the ordinary self-protecting maladies may be likened to a loaded bomb-shell fitted with a time-fuse —this latter representing the incubation period, and varying in duration according to the illness under consideration. It is obvious that the total effect of the explosion of one such bomb will vary in accord with the number of "sensitive" charged bombs which happen to be in its neighbourhood when it "goes off": in other words, the size and the duration of the epidemic will depend upon the proportion of susceptible boys in the school at the time—whatever the particular malady may be.

Now careful study of the epidemic returns derived from many different school records showed several interesting results.

(1) That there is a "critical figure," or "Explosive Ratio," for each infectious malady, indicating that when a certain proportion of the boys in the school *un*protected by a previous attack of the illness in question has been attained, an epidemic outbreak of that illness is due, and may be looked for with confidence.

(2) The number of boys affected during the epidemic will be determined mainly by three factors: (*a*) the number of secondary foci started by the first case before he was discovered and isolated; (*b*) whether the mischief was started quite early in the term or nearer to its end; and (*c*) the nature of the disease.

Confining ourselves to measles, and grouping the larger schools having an entrance age of between twelve and thirteen, a leaving age of about eighteen, and a total number in residence during every term of from 350 to 600, we can tabulate the conclusions as follows:

Law I. Let U = the total number of boys *unpro-*

tected by a previous attack; and T = the total number of boys in the school: *whenever* $U = \frac{T}{3}$ *an epidemic may be expected.*

That conclusion, originally put forward as "an Empirical Law" in 1889, has stood the test of time, and its practical truth still holds good.

It is of value because it at once puts the Medical Officer on the *qui vive*, and he, the matrons and the nurses are prompted to keep a keen look-out for any boy developing signs of impaired well-being, and at once securing his isolation and observation.

The second conclusion which emerged was one of no less practical importance:

Law II. *In such an epidemic* (*if it have full scope, by beginning, for example, early in the term*) *three-sevenths of the total unprotected may be expected to be attacked.*

Such knowledge is of value, because it indicates the number of beds which will be required, and the arrangements which will be called for to meet this emergency. And shortly after this warning had been published, Mr. Armstrong, the M.O. of Wellington College, supplemented it by showing that if the initial case of measles be speedily followed by several others—showing that several secondary foci are at work—available beds will be rapidly filled during the earlier period of the epidemic.

The two preceding rules may be conveniently combined in one formula:

When $\frac{T}{3}$ *are unprotected by measles, an outbreak may be expected; and in this outbreak* $\frac{3}{7}$ *of* $\frac{T}{3}$ $(= \frac{T}{7})$ *will be attacked.*

As a corollary it may be stated that—

Law III. *If the epidemic prove much less extensive than it should have been according to Law II* (*owing*, e.g., *to its beginning about the middle or towards the end of term*), *the next epidemic may be expected after less than the usual interval* (*i.e.* as soon as the explosive ratio is again attained).

If the *maximum* age of entrance does not exceed twelve years, fully 25 per cent., or *one-fourth*, of the whole school, will probably be attacked in any "full-scope" epidemic of measles.

Rubella (German Measles) in its epidemic form is rarely coincident with *Morbilli*, though it often precedes or follows that disease.

Mumps is responsible for many and extensive epidemics before puberty; after the age of fourteen or thereabouts its incidence is much less regular and, as a disease by itself, its epidemics are seldom large. But it appears that if *Mumps* occur coincidentally with *Measles*—and so early in the school term as to allow the disease "full scope"—the number affected may equal or even exceed the number attacked by Measles; and a similar observation applies, though possibly with less force, to coincident epidemics of *Mumps* and *Rubella*.

Second attacks (not mere relapses) occasionally occur.

Outbreaks of *Pertussis* (whooping-cough) are irregular and conform to no obvious rule. The disease does not give rise to extensive epidemics in schools the entrance age for which approaches that of puberty; yet the steady toll which it claims year by year enables it to march approximately abreast with the results of the more spasmodic *Measles*.

Young children readily take *Varicella* (chicken-pox); but in schools of higher age it does not give rise to extensive epidemics; the earlier cases being easily detected and promptly isolated.

Scarlatina.—The percentage of unprotected is large —nearly 75 per cent.—yet epidemics are not large for the same reasons which apply to chicken-pox. Should on any occasion the number threaten to become large, or should cases continue to drop in over a period at all prolonged, the M.O. would have reason to suspect the existence of some insanitary condition in or near the school premises; or the existence of an ambulant "Desquamator": the danger of the latter is more likely to be due to the shedding of infected epithelium from the kidneys and bowels (and possibly from the throat and nose) than to the scaling of the dried epithelium from hands and the like.

Diphtheria, of course, demands prompt and effective isolation, adequate treatment by modern methods and a thorough examination and testing of possible contacts. Simple chloroform water, used as a mouthwash, gargle and nasal douche or spray, from the beginning is very useful. It has been found most effective in the treatment of that often exceedingly troublesome personage—the diphtheria "Carrier."

The infection of *Measles* is easily destroyed by simple antiseptics. A full day's exposure to summer air and sunshine will suffice for the disinfection of ordinary fomites—such as clothing, blankets, etc.

Parents sometimes ask, "Why, in your public schools, do you so often have these large epidemics?" The reply is an obvious one. For many years past the parental public has become more and more educated in the

Elements of Hygiene—and especially so as these affect the management of the commoner infectious illnesses of childhood. Thus they have come to learn and to practise more and more intelligently the early recognition of these maladies, and the simpler methods of protecting their own children from their incidence. One inevitable result of this has been the steady rise of the number of children who reach their schools every term *un*protected by a previous attack at home. This result is unfortunate for both the parents as well as for the schools. Let me cite only one example: an epidemic of (say) 70 boys taken ill with measles during a school term represents a total loss to those boys of at least two thousand working days.

Now measles of the ordinary mild type is really a trivial malady, if treated with ordinary care and discretion; and parents would be well advised if they were careful to expose their healthy children at an early age—of about eight years—to such infection, and thus to gain for them the benefits of its self-protection. The resulting immunity would be a general gain to the child, the home and the school.

There is another aspect of infection worthy of attention. A child already protected by a previous attack of some self-protecting malady (measles, let us say) has had his whole body so modified that the measles germ no longer finds in his tissues material suitable for its life and development. The altered constitution of those living tissues must also mean a corresponding alteration in their constitution when dead and being got rid of. May we not assume that the excretions of such a "protected" child—the exhalations from his lungs and skin, for example—also differ in this respect from those exhaled by another child who is still susceptible to the same malady?

Consider, then, in this light, the contrasting conditions presented by two separate bedrooms—one of them occupied by children all susceptible to measles; the other by individuals who have already had that malady. Will not the atmosphere of the first room—warm, moist, and charged with organic matter favourable to the development of the measles germ—form a "culture medium" most admirably adapted to the growth of that *contagium* (should it be introduced) *and* to its development of increased virulence, as contrasted with the unfavourable soil provided by the air of the other room, which contains children who have been exhaling from their immune bodies organic matter which is, by its derivation, inimical to the life and growth of the virus?

Herein perhaps lies the explanation of the well-known facts:

(1) That overcrowding of susceptible individuals not only favours the occurrence of epidemic disease, but in proportion to its degree tends to impart to the disease a more virulent character.

(2) That in proportion as the number of susceptible individuals in a school is relatively increased, do we provide the conditions—personal and atmospheric—which are necessarily antecedent to the occurrence of an epidemic; much as an outbreak of fire in a building would be rendered probable in proportion as it became filled with flimsy and combustible material capable of exhaling inflammable vapour; and—

(3) That, even in schools loaded, as it were, with pupils *un*protected by previous attacks of infectious

disease, a single case of such illness may be rare, and an epidemic practically unknown, *if* its several buildings are detached, and all of them flushed to the fullest possible extent by that most efficient germicidal combination, Sunshine and Fresh Air.

This last is not a mere theoretical assumption. For several years I had an intimate acquaintance with the daily life of a large school in which, during the forty odd years of its existence, there had not occurred a single epidemic of any one of the infectious maladies common to early life.

On two separate occasions in three years a single case of scarlatina occurred; such methods of isolation as were adopted we should now regard as absolutely futile; but in neither instance did the disease extend beyond the initial case.

On another occasion, for several months the native population of a neighbouring city were dying of a virulent type of measles at a rate which raised the death-rate of the whole city to over 60 per 1000 for weeks together.

But, although communication was wholly free and unrestricted, and the school comprised a considerable number of day-boys, not one case of measles appeared amongst the school community.

To my mind, the only adequate explanation of this remarkable immunity is to be found in the conditions under which every member of the school lived; in that—the school buildings consisted of small detached blocks, none of more than two floors, scattered over some fifteen acres of dry sandy soil. Across the narrow isthmus on which they stood "a broad and equal-blowing-wind" swept day and night from the Atlantic to the Indian Ocean, tempered by belts of odoriferous pine trees; a sub-tropical sun shone from a clear high sky; every room was lofty, well lighted by large windows providing cross ventilation; and each dormitory was situated over a room which was not occupied during the later hours of the day, so that the air breathed by the sleepers was never vitiated by a pre-breathed atmosphere, mixed with the products of combustion from artificial lighting, making its way up through ceiling and floor from heated rooms beneath.

Of course an immense asset to the schoolboy's welfare is the enjoyment of good health—health of both body and mind. If he is exposed to any infectious malady, he will suffer less severely from it, and is likely to make a more speedy and complete recovery. And in this connection let us recognise the special value of those *open-air* games which the healthy schoolboy so delights in, and which have for him a special—and often an unrecognised—value of their own. It may be recalled that, several years ago, a famous motorist essayed to drive a large car at high speed at Brooklands for twenty-four hours on end. He achieved the feat, but, when he left the car, was so overpowered by sleep and the continuous effort that he could do no more than swallow a cup of bovril and stagger to bed—to sleep the clock round. His blood was examined just before the start and at the finish: and it was found, despite all the fatigue and strain entailed by this prolonged effort, that his "Opsonic Index" (*i.e.* the measure of his bodily resistance to disease) had been trebled. A strong argument, that, in favour of exercise *in the open air.*

It has sometimes been suggested that efforts should be made to abolish measles in this country.

With the present volume of free and constant intercommunication with all other countries, this appears to be virtually impossible: and, supposing that it could be accomplished, the result could only be disastrous. History records several instances in which, during the past, a country has succeeded in abolishing measles for a time, only to suffer from the malady in a much more serious and fatal form after its inevitable re-introduction to a population who had lost that birth-share of immunity which used to be bequeathed to them by their parents and had been deprived of all opportunities of acquiring immunity themselves.

The only sensible course left to us to-day is to acquire self-protection by contracting a mild form of the malady as early in life as possible—and to congratulate ourselves on having, at so trivial a price, secured immunity from a disease which—in the squalid and non-hygienic days of our not very remote ancestors—was nothing less than a dangerous and devastating plague.

AFFECTIONS OF THE NOSE, THROAT AND EAR AND THEIR PREVENTION

By R. Scott Stevenson, M.D.

Most diseases of the nose, throat and ear have in early years their beginnings in the nose and nasopharynx, and in the child of school age the most important affection of that region is undoubtedly adenoids.

Adenoids

Adenoids are a hypertrophy of lymphoid tissue which is found normally in the post-nasal space, between the back of the nose and the mouth. This mass of lymphoid tissue is sometimes termed the pharyngeal tonsil, and forms a unit in the chain of superficial lymph glands called Waldeyer's ring, other units in which are the faucial tonsils on each side at the back of the mouth and the lingual tonsil at the back of the tongue. Adenoids usually occur at school age, between four and fifteen years, but sometimes they may be present even at birth. The adenoid mass has a definite structure, resembling that of the tonsils, except that none of the crypts characteristic of the tonsils are present, and the surface of adenoids is covered with ciliated epithelium, a different type of covering cell; the mass is formed of several vertical folds separated by deep furrows, and it is considerably thicker at the upper end than at the lower.

The cause of adenoids is not precisely known, but infection from colds and infectious fevers probably plays the greatest part in their production; improper feeding, particularly on starchy artificial foods, heredity and a damp climate are all contributory elements in their causation. The baby's "comforter," which is often blamed, helps to cause adenoids by acting as an agent of infection. The relation between rickets and adenoids has been pointed out, and certainly the so-called adenoid facies is most marked in rickety children. This facies, the characteristic appearance of a child affected by adenoids, comprises an open mouth, thick lower lip, broad bridge of the nose, and a pinched, dull, stupid look generally. The common symptoms of adenoids include mouth-breathing, snoring at night, and frequently recurring colds. The teeth are usually irregular and frequently carious, and the arch of the palate is of the Gothic, or narrow, high, pointed-arched type; one school medical officer of my acquaintance has told me that for the past year or two, since I pointed it out to him, he has diagnosed the presence of adenoids from the shape of the palate alone, and subsequent operation has shown that in no case had he made a mistake. Most children with adenoids are unable to concentrate their attention, are dull and listless, and easily tired, while their physical development is usually poor, deformities of the chest being particularly common. Perhaps the most serious symptom, however, is deafness, and children who have adenoids are probably brought to the doctor most frequently because they complain of deafness, which is caused by the adenoids in the post-nasal space obstructing the Eustachian tube, or by infection from the adenoids setting up inflammation in and discharge from the ear. Deafness may, indeed, be the only obvious symptom of adenoids, for many children keep their mouths closed in spite of considerable nasal obstruction, although the chest when examined is usually found to be flat or deformed.

Adenoids can be cured by operation, and by operation only, which should be performed no matter how young the child may be. Breathing exercises, and the excellent practice of blowing the nose first through one nostril and then through the other, may help to prevent the development of adenoids; but when adenoids have actually developed, operation is the only cure. It is simply untrue to pretend that adenoids, once present, can be cured by sneezing exercises, breathing exercises, iodine and other drugs, vaccines, ultra-violet rays, *et hoc genus omne.* The objection is sometimes raised to operation that the adenoids will disappear as the child grows up; it is true that adenoids tend to atrophy about the age of puberty, but by that time the mischief which they cause has been done and is irreparable. Another objection often made is that the child is delicate and the operation ought to be postponed until its health has improved; but in such a case it is forgotten that part at least of the cause of the poor health is the adenoids, and the health cannot improve until they have been removed. If the adenoids are properly removed, from the fossæ of Rosenmüller at the sides as well as from the middle of the post-nasal space, they should not recur; but occasionally an infectious fever may cause hypertrophy of some insignificant portion of lymphoid tissue which has not been cleared away at the time of operation. Still, in any case, the risk of aural complications of the infectious fever is undoubtedly lessened by the previous operation.

After adenoids have been removed, the full benefit of the operation will not be gained unless the child is taught to breathe through the nose in the normal manner. The simpler the breathing exercises are the better is it, and five minutes morning and evening is sufficient time to devote to them, once they have been learned. The patient should stand with his arms out at the level of the shoulders, and as he takes as deep a breath as possible, through the nose and with the mouth shut, he should stretch his arms out to their fullest extent, and then slowly move them round until one arm is straight in front and the other straight behind, keeping the head steady; this movement should be repeated several times, taking a deep breath each time, and expelling the air as much as possible at the end. The patient should then stand with his arms stretched as high as possible above the head, again taking a deep breath through his nose, with his mouth shut, and then, holding the shoulders back, his arms are slowly flexed until the hands are at the level of the shoulders, and the breath expelled, the head being allowed to fall forwards; this movement should similarly be repeated several times.

THE NOSE

Most nasal troubles in children of school age arise from adenoids, one of the common symptoms of which is a constant nasal discharge. It should be noted, however, that a foul discharge coming from one nostril only is pathognomonic of a foreign body, such as a button or a bean, in the nose. An unskilled person should never attempt to remove a foreign body from the nose, as serious damage may be done.

In adults, a common nasal affection arises from deformity of the nasal septum preventing proper drainage of the nasal passages; but in children such deformities are rare, as they are caused either by injuries or by the downward development of the face following the expansion of the brain cavity in the adult.

Suppuration in one or other of the nasal sinuses, which is frequently overlooked even in adults as a cause of ill-health, is more common in children of school age than is generally imagined, and should be kept in mind by school medical officers as a possible cause of an obscure infection. I have known cases diagnosed as pulmonary tuberculosis (negative for the tubercle bacillus) which were in reality cases of nasal sinus suppuration. Transillumination of the maxillary sinuses is a simple procedure, which should be carried out more frequently than is done at present in children with symptoms pointing to nasal affection, where adenoids have been excluded. Inflammation of the nasal sinuses may occur in the course of a cold in the head, but is more commonly due to an infectious fever or to influenza.

THE TONSILS

The faucial tonsils have already been described as part of Waldeyer's ring of superficial lymph glands.

Various obscure functions have been ascribed to the tonsils, but in reality their chief function is, like that of any other lymph gland, to act as bulwarks against the invasion of the body by bacteria. It is possible, however, that, like the thymus gland, they have some special function—endocrine or otherwise—in the earlier years of life, and for this reason I am disinclined to enucleate the tonsils of children under the age of five unless there are very definite symptoms which call for their removal; I must repeat, in this connection, that adenoids, on the other hand, should always be removed when they are found to be present, even if the child is only a week old.

The tonsils consist of two oval masses of lymphoid tissue, about an inch in length and half-an-inch from before backwards, placed at the back of the mouth, facing one another on opposite sides of the upper part of the throat. On the surface of the tonsil there are about a dozen little openings which lead into crypts extending through the substance of the gland. To examine the tonsils, two spatulas should be used, one holding the tongue down, and the other placed just in front of the tonsil, exerting steady pressure outwards and backwards, so that the tonsil, even when it is flat and hidden, emerges fully into view. Although the tonsil is a bulwark against bacterial invasion, it becomes a menace if the infection has been too much for it to deal with, so that it has become either enlarged, or septic, with the crypts full of pus, or both. Acute inflammation of the tonsil (tonsillitis) may result from a cold, from a septic condition of the teeth or gums, or from an infectious fever; scarlet fever and diphtheria have a special affinity for the tonsils, and there is undoubtedly a relationship between tonsillitis and rheumatic fever (acute rheumatism). It used to be imagined that enlarged tonsils did harm only because they obstructed the airway, and the method of treating the condition was to cut off part of the enlargement. It is now realised, however, that a tonsil is harmful only when it is infected, and that while many enlarged tonsils are infected, a small, hidden tonsil may be more septic and may cause much more harm than an enlarged tonsil. I never advise removal of the tonsils in a child merely because they are enlarged; but when I can squeeze foul-smelling pus from a tonsil, and I find the glands of the neck enlarged and other signs and symptoms of general ill-health, then I realise that it would be a waste of time to gargle with antiseptics, or to paint the tonsils with iodine or other throat paints, or to have them shrunk with X-rays or radium, or to have them cauterised or electro-coagulated, or to have ultra-violet rays applied to the throat, or to have the child sent to the seaside or the country for a holiday. When, therefore, the tonsils are septic and showing signs that they are infecting the body they ought to be removed, and removed completely. Personally, I prefer to remove tonsils by dissection, as this method does not bruise or damage the throat, causes little or almost no bleeding, and ensures complete removal of the entire tonsil in every case; many surgeons are, however, content to remove tonsils with a guillotine. A number of serious diseases, such as rheumatism, goitre, chorea, tuberculous glands of the neck, and heart disease are rightly attributed to infected tonsils, and it is an undoubted fact that children whose tonsils and adenoids have been completely removed are less apt to contract scarlet fever and diphtheria than those who have enlarged or unhealthy tonsils.

THE EARS

Perhaps the most important subject of all connected with affections of the nose, throat and ear in the child of school age is that of deafness and its prevention. To the child, deafness is a much more important disability than might be imagined at a first glance. It is more serious than blindness, for, while a blind child can be educated at the ordinary schools with normal children, a deaf child cannot be educated along with normal children. As that wonderful deaf-mute and blind woman, Helen Keller, once said: "Deafness means the loss of the most vital stimulus—the sound of the voice—that brings language, sets thought active, and keeps us in the intellectual company of man."

There are two main types of deafness—namely, obstructive deafness, which affects the external ear or the middle ear (behind the drum), the parts concerned in conducting sounds inwards to the internal ear; and nerve deafness, which affects the nerve endings in the internal ear or the nerve of hearing itself, or even the hearing centres in the brain.

Plugs of wax in the external ear passages account for many cases of deafness in school-children; they should be readily recognised by pulling the outer ear backwards and looking into the ear passage in a good light, and they are usually easily removed by syringing.

About 90 per cent. of all cases of deafness in children of school age, however, are due to affections of the middle ear, either suppuration and discharge from the ear, or catarrh and obstruction due to adenoids; both causes may be present together. Infectious diseases, especially scarlet fever and measles, are the chief causes of suppuration in the middle ear at school age. In infants, tuberculous disease is a common cause of middle-ear suppuration (50 per cent. of cases, according to Dr. Logan Turner), the infection arising from feeding on tubercle-infected cow's milk; but it is a rare cause in older children, as it usually causes death before school age.

Acute inflammation in the middle ear, which precedes suppuration, discharge and deafness, is one of the affections of childhood which is most frequently overlooked, even by doctors. Earache in a child should always be taken seriously, and the ear examined; in the early stages of middle-ear inflammation the simple little operation of incision of the drum, which can be performed by any doctor after a little practice, gives excellent results regarding both cure of the inflammation and the preservation of hearing. If the drum were more frequently examined and incised when bulging or when pain is persistent, not only would fewer cases of deafness result from inflammation and suppuration in the middle ear, but fewer mastoid operations would be necessary. The micro-organisms which cause inflammation of the middle ear always come from the nose and throat, and such an inflammation is much more likely to occur when adenoids are present in the naso-pharynx. The abscess which is formed in the middle ear soon bursts through the drum, as the other walls are formed of bone, and the discharge in favourable cases gradually diminishes and eventually ceases altogether after a few days or two or three weeks. In unfavourable cases, and when it is not treated, the discharge may continue indefinitely; the condition is then known as chronic middle-ear suppuration, and, if the infection is a virulent one, may lead to inflammation of the mastoid or sometimes even to meningitis and death. The discharge is often best treated by removal of adenoids when they are present, as they frequently are; I have seen many cases of long-continued ear discharge in children clear up at once on removal of adenoids, and I have been able to cure several cases of apparently commencing mastoid inflammation in children, sent to hospital for an urgent mastoid operation, by immediate removal of adenoids only. When, however, in spite of conservative treatment, the ear discharge continues, it may be necessary to perform the simple mastoid operation; but I deprecate entirely the wholesale performance of mastoid operations for the treatment of ear discharge, which has been advocated by some surgeons.

A child should never be allowed to leave a fever hospital with discharging ears; it is still disputed whether scarlet fever infection is conveyed by the discharge from the ear, but certainly in my opinion the weight of evidence is in favour of its doing so, and the risk ought not to be taken. The discharge should be cured while the child is still in hospital, whether by conservative means or by operation, and for this purpose all fever hospitals should have otologists attached to their staffs, so that the affected ears can be effectively treated at as early a stage as possible. Measles, which ranks next to scarlet fever as a cause of middle-ear suppuration, is a disease which ought to be taken much more seriously by the general public and by local authorities than it is at present. Measles causes more deaths nowadays among young children than do many diseases, such as scarlet fever or small-pox, that are much more generally feared. It is not yet even universally notifiable in this country; and all local authorities ought to make provisions for the nursing of severe cases of measles in the infectious disease hospitals.

The most common form of deafness in adult life is that termed chronic catarrhal deafness or, to describe it more accurately, chronic adhesive process in the middle ear, and nearly all of these cases result from adenoids in childhood. The adenoids may atrophy and disappear as the child grows up into the adult, but they leave their evil effects behind them, and deafness comes on nevertheless. If any advance is ever to be made in the direction of the prevention of deafness, the first steps must be taken during the period of school age, and adenoids, as I have already emphasised, removed at once whenever their presence is recognised.

Nerve deafness is that form of deafness which affects the internal or perceptive part of the ear, and for which, once it is established, nothing very much in the way of treatment can be done. It is nerve deafness that usually afflicts deaf and dumb children; their disability is of the hearing sense alone, for their dumbness results only from their never having heard the spoken word, and can usually be overcome by patient and prolonged tuition. One of the commonest causes of nerve deafness in children is meningitis; it has been stated that about a quarter of all cases of acquired deafness in children are due to meningitis, which may be due to many different causes, such as tuberculosis, syphilis, cerebro-spinal fever, scarlet fever and other infectious diseases, pneumonia, and to extension to the meninges of middle-ear inflammation. Mumps sometimes causes internal ear deafness, and should therefore not be looked upon too lightly as an infection of little importance. Internal ear deafness from mumps is not so rare as is sometimes stated, as I have myself seen several cases, for which no treatment was of any avail. Congenital syphilis is a not infrequent cause of internal ear deafness, both among children who are deaf at birth and who become deaf in early life. The only hope of cure is early, energetic and intensive treatment by modern methods. Congenital syphilitic deafness is more common among the poor, who neglect to obtain adequate and effective treatment of the disease when it has been contracted; compulsory notification would no doubt diminish the number of uncured cases.

There is, however, a common form of hereditary deafness which has no relation whatsoever to syphilis, and the children affected by it are usually otherwise healthy and intelligent. To prevent this type of deafness is a very difficult and thorny problem, and it is necessary, as Dr. Kerr Love has pointed out, to take a long view. The Mendelian theory throws a good deal of light upon this subject. Mendel pointed out that if a tall and a dwarf pea plant were crossed, all of the offspring were tall, and there would be no dwarfs. But in the next generation, if the plants were allowed to fertilise themselves, the grandchildren would show dwarfs among them, in the proportion of one in four, and there would be no half-sizes—they would all be dwarf or tall. For however long these tall plants were bred from, in future generations there would always be a certain proportion of dwarf plants; one-third of the tall plants would breed only tall ones, but the other two-thirds would breed dwarfs as well as tall plants. The proportion of dwarf plants would gradually diminish, but an occasional one would always be turning up. Much the same thing, then, happens in this type of hereditary deafness, and if it is to be wiped out of existence, one would have to lay down the law that the hereditarily deaf should not marry and also that the hearing relatives of the hereditarily deaf should not marry. It is a curious fact that the deaf tend to marry the deaf, presumably because the bond of their mutual affliction tends to bring them together, and because of the ease with which they are able to communicate with each other. But before society takes upon itself the prohibition of marriage among the hereditarily deaf it must take care that the arrangements it presumes to make for the welfare of the deaf do not assist in bringing the deaf more into each other's company and thus tend to perpetuate hereditary deafness. There are two important factors that favour this—namely, the segregation of deaf children in institutions, and the teaching of the language of signs, by which the deaf cannot communicate with the outer world. The remedies for these defects—which must precede any appeal to the hereditarily deaf not to perpetuate their disability by intermarriage—are, first, the widest possible extension of the day-school system for deaf-mutes (which is carried out very efficiently, for example, by the London County Council), and, second, the abolition of the language of signs in instructing them, substituting for it the oral method of instruction, so that speech and lip-reading become the ordinary methods of communication alike among the deaf and between them and the rest of the world.

THE EYE TROUBLES OF SCHOOL LIFE

By Lt.-Col. R. H. Elliot, M.D., D.Sc., F.R.C.S.

I do not propose to deal here with the subject of errors of Refraction, as I went into that very thoroughly in a previous lecture, which has been printed with others of the same series in book form, and is to be obtained at the office of the Institute; but before passing on to my real subject, there are just a few points in connection with the fitting of glasses during school age that I would like to repeat and emphasise. I will do it categorically, for the sake of brevity.

(1) In any case of doubt a child's eyes should be carefully examined and glasses fitted if necessary.

(2) It is unwise to think a boy lazy until it is certain that he is not suffering from eye-strain. Many such children avoid work in self-defence. They are following a natural law which bids them avoid what causes them suffering. Fit them with suitable glasses and they may become changed children.

(3) Never suspect a child of shamming because he says he cannot see the blackboard. Have his eyes tested. Very few healthy children sham. Many afflicted ones are wrongfully accused of doing so. This breeds a great sense of injustice in their minds, because they don't know how to clear themselves, and are puzzled themselves to account for their defects,

which, for want of any power of comparison with other people, they find it hard to understand.

(4) The rule for young people: Good print, on good paper in a good light, must be remembered both in the house and in the school.

I can now go on to a much harder task, viz. the discussion of a number of conditions which are very little known to the public at large, but which it is important they should know something of for the sake of the children.

Epidemics of Ophthalmia are very frequent in tropical countries, and are not by any means uncommon in Great Britain. They sometimes attack schools, and spread through such establishments with great rapidity. I have known an instance in which the seriousness of the condition was not apprehended in time, and the girls were allowed to scatter to their homes without proper warning being given, with the result that fresh epidemics were started in other places. These cases should never be handled by lay persons or with the aid of domestic remedies. The most competent medical assistance available should be at once called in. The affected children should be carefully segregated; great care should be taken to supervise the washing arrangements of the institution; each child should have his or her own towels and handkerchiefs; no case with the least suspicion of an attack commencing should share a basin or bath with healthy subjects.

There is a form of epidemic conjunctivitis which has earned the name of "Swimming-bath conjunctivitis," owing to its being spread among the bathers by infected water; this has been known to occur even in very clean and carefully supervised baths, and has occasioned much anxiety amongst medical officers of health as well as those responsible for the baths.

Those who are exposed to much dust are very apt to get some form of conjunctivitis. It was formerly thought that this was due to the germs of the disease being carried in the dust and implanted upon the eyes. We now know that drying up kills most of the germs which are responsible for causing ophthalmia, and the idea of air-borne epidemics has had to be given up. Whilst such diseases are now known to be carried by water, by flies and by direct transmission from eye to eye by the hands and other vehicles of contamination, there can be no doubt that dust plays a very important, even if a secondary part, in not a few cases; for dust irritates, congests and excoriates the lining membranes of the eyes, and so prepares the ground, as it were, for the successful growth of any organisms which are accidentally implanted on the eyes. For this reason, those who motor much, especially in open cars, and most especially of all on motor-bicycles, should invariably wear protecting goggles. If this were made a routine practice, it is quite certain that a lot of people who now come to consult ophthalmic surgeons would have no occasion to do so. You will see that in giving you this advice I am not thinking of the so-called trades-union interests of my profession.

A last word before I quit the subject of Ophthalmia: it is a safe rule to regard any eye which is discharging an unusual amount of fluid as a possible source of infection to other eyes. I of course except tears shed in grief, etc., and the watering that follows the invasion of an eye by some foreign body.

Trachoma, Granular Ophthalmia, or Egyptian Ophthalmia, is a scourge of civilisation which has become much more common in Europe since the Great War. America excludes from her shores anyone who shows any signs of this disease. France and Spain are both highly perturbed over its increase, especially along the parts of their coast-lines which face out towards Africa. Here in England we are lucky to know but little of it, though we still see cases, some of which are in patients coming home from Egypt, India and other tropical countries. The disease is not infrequently diagnosed as occurring in children. The disease which is sometimes mistaken for it is an altogether milder condition known as "Follicular Ophthalmia." The main difference between the two conditions is that whereas trachoma leaves very serious marks on the eyes, often permanently damaging vision, the follicular condition is a mild, transitory and comparatively harmless affection, which, if not overtreated passes away of itself, and leaves no serious consequences behind. Very mild treatment is called for in these cases. The protection of the eyes from wind and from the action of salt water will often suffice to cure the disease, which is sometimes seen in children who have been doing much bathing whilst spending their holidays at the seaside. In contrast to this, it remains to be said that the treatment of trachoma must be very prolonged and severe. The appearance of a condition which may turn out to be true trachoma is a signal for the isolation of the patient so far as towels, handkerchiefs and washing arrangements are concerned. No precaution should be relaxed until the diagnosis is assured.

Glare Asthenopia is a condition which is very frequent in tropical lands, where the force of the sun is much greater than it is with us. None the less, it is far from uncommon over here. The child complains that as he goes to and returns from school, or as he walks about the town, he is much troubled by the glare off the pavements. Foolish people are prone to put such troubles down to imagination, whereas they are very real and very painful. Another piece of folly in the same connection is to tell the child to walk about without any eye protection, and so to "get used" to the sunlight. No greater mistake could be made. The patient who is sensitive to sunlight should keep out of glare in every possible way. He should not be taken to sunny or to snowy lands. The more he exposes himself to the glare the worse he gets. The true way to cure these cases is to *keep them out of bright sunlight as much as possible*, and to treat their eyes with mild and soothing remedies. When they have to go out in the sun, they should wear protecting glasses; the best form of the latter is that known as Crookes's glass, especially the darker-tinted variety called "Crookes's B glass."

In the same connection a word should be said about the habit some small boys engage in of staring at the sun. It is a most foolish and dangerous trick; it may not only lead to the eyes being made very sensitive to glare for years afterwards, but may even end in partial blindness. The idea that some small boys have, that in staring at the sun they are imitating that king of birds, the eagle, is founded on a fallacy, for when the eagle hangs suspended about the earth in the blue vault of heaven, he is very far from studying the solar globe; indeed all his attention is being turned not only to earth, but especially to that most prosaic of mundane occupations, the search for a good dinner.

Injuries to the Eyes.—It has been estimated by a reliable authority that of the eye accidents occurring in civil life—as contrasted with those met with under military or industrial conditions—over 50 per cent. occur before the age of sixteen. Many of these accidents result in the loss of one eye, and not a few in total blindness. They are chiefly caused by forks, scissors, knives, hat-pins, pointed sticks (used as swords, etc.), stones, toy-cannons and guns, airguns, catapults, tip-cats and a host of other similar means of childish amusement. I have seen an eye lost by a boy looking down an airgun, thinking that as there was no pellet in it, he was safe—a very misleading idea, as the rupture of his eye proved. There are some very clear lessons to be learnt from these facts.

(1) *Children should never be allowed to run about with pointed weapons in their hands:* it is a most dangerous practice. Unfortunately the standard of discipline and obedience has fallen very low in recent years. One continually hears parents forbid a child doing a certain thing, and then sees them shrug their shoulders and allow him or her to have its own way, "for the sake of a quiet life," or for fear of forfeiting the child's affection. Our fathers erred through ignorance; they would not have allowed these things if they had been warned. The present generation sins from slackness. Long years ago there was a man who tramped to and fro in an asylum, moaning all the time, "Of, if I hadn't." A terrible railway disaster had followed a lapse on his part from the path of duty, and had cost

him his reason. Repentance came too late. It is too late to mourn when the child is blinded. Firmness in such matters is imperative, and apart altogether from this particular application, it makes for the welfare and the happiness of the child. Anything more dreadful than the typical ultra-modern child, especially of one particular nationality, as one sees him in continental hotels, can hardly be imagined. Unfortunately, a number of our own people are copying the same example. One of the outstanding features of modern life is the loss of parental control. To me it appears to amount to a national danger.

(2) *Boys and girls when they take part in sports which have an element of danger in them*, such as shooting, fencing, playing rackets, etc., *should be most thoroughly drilled in "the rules of the game beforehand."* Until they are well grounded they should always be under very careful control, and the least sign of want of care should be heavily penalised.

Foreign Bodies in the Eyes.—These should always be removed as soon as possible. Whenever expert medical assistance is available, it should be had recourse to in the first instance, and at the earliest possible moment. If such aid cannot be got, it is safest to use a clean handkerchief to remove the body if it can be seen, and not to employ hard and sharp instruments. I have seen the front of an eye extensively ploughed up by a well-meaning friend in an endeavour to remove what he was persuaded was a foreign body; it was really a fleck of pigment on the iris or coloured membrane of the eye, and had been there since soon after birth. Very often tying the eye up with a clean handkerchief greatly relieves the pain. Warm applications are also useful. It is a mistake to press on the lid from outside, as by doing so you may imbed a loose bit of grit in the cornea (or clear front of the eye), and so make its removal much more difficult. Gentle friction of the lids over the eye will sometimes detach a loose foreign body, but not very often. I am told that the boy scout is taught to evert the upper eyelid. Very often, by doing so, the foreign body can be seen adhering to the inner surface of the lid, and if so it can easily be rubbed away with a handkerchief, to the great relief of the sufferer.

Still, when all is said and done, I would repeat my first bit of advice, *get expert help, if you can, and as soon as you can.*

Styes, Cysts of the Eyelids, and Chronic Inflammation of the Lid Edges and of the Conjunctiva, or lining membrane of the eyes, are often signs that the child needs suitable glasses. This is, however, not quite the whole story. You will often hear that a boy or girl started styes after an attack of measles, or of some other epidemic disease. The connection is a very interesting one and deserves your attention. We get boils or styes whenever our resistance to certain germs falls below a fixed point. The germs, like the poor, are always with us, but they can only effect a lodgment in our skins under favourable conditions to their growth. Any illness may reduce our resistance and give the germs their chance, which they promptly take. But what determines the eye being the point sometimes attacked instead of the neck or any other part? Just this! Many of us need a little correction with glasses to enable us to see without effort. So long as we are well and strong, the small effort involved in overcoming the error in our sight does not count for anything, but the moment we are weakened from within, the strain is enough to turn the scale against us and to give us styes, etc. There are two lessons here:

(1) Keep the child in good health, and if his resistance to this particular form of germ is reduced by recent illness or otherwise, build it up, as you can easily do, by the use of vaccines. Such vaccination is painless, harmless, safe and certain in its action. The treatment should, of course, always be carried out by medical men.

(2) Get the refraction carefully tested, and have suitable glasses fitted. Thus the trouble is attacked from two sides and is soon put an end to.

Chronic inflammations of the eyes are Nature's warnings of strains, and her call that we should put an end to them in our own interests.

Venereal Disease.—It is an appalling reflection that, by a law of Nature, the sins of the fathers are so often visited on the children. No application of this rule is more striking than the case of venereal disease. The subject divides itself naturally into two heads: (1) gonorrheal affections, and (2) syphilitic affections.

(1) *Gonorrheal Affections.*—The child who suffers from gonorrheal ophthalmia acquires it from the maternal passages in the course of birth. The consequences are always serious and often catastrophic. The pity is that the children should suffer so disastrously, for, given due care at birth, the child's eyes can be protected even though the mother be badly infected. Needless to say, the maternal infection comes very often from the father, who first infects the mother; she in turn hands on the poison. As seen

during school life—and it is this department of the subject with which I have been asked to deal to-day —the child is handicapped by having one eye, or even both, damaged to such an extent that vision is often very seriously interfered with. Two questions open out from these reflections: (i) the prevention of the infection, and (ii) the education of the child. I shall speak of these in turn.

(i) *The prevention of the infection.*—This can be effected in two ways. Firstly, there is the treatment of the mother before the confinement and of the child's eyes immediately after birth. A great advance in these matters has been made during the last few decades, and gonorrheal ophthalmia, with all its horrors, is being greatly reduced in frequency in all civilised countries. Then in the second place much can be done to prevent the infection of young men, by instructing them as to the methods of self-protection. This is not the place or the time to discuss this most important question, but I have felt that it is necessary to allude to it. I shall dismiss it after making one remark, on which I lay very great stress. Let us admit that the subject is highly controversial, and that the difficulties and dangers surrounding the action I have alluded to are very great; let us further admit, too, for the sake of the argument—though I do not really admit it for a second—that a man should be punished, as some hold, for any lapse from virtue; I would then ask you two questions, and I would ask your adamant and righteous zealot to answer them:—What about the innocent girl who is made a sharer in the fruits of the man's long-past error, and what about the children, who have offended no law, and who are doomed to suffer cruelly throughout life for an act in which they had no part whatever? I do not think that civilised society has yet faced these questions as they deserve and demand to be faced.

I shall leave the question of the education of the child on one side for the moment until I have dealt with the next heading.

(2) *Syphilitic Affections.*—The above reflections crowd thick upon us as we come to discuss this second division of our subject. Let me read you a paragraph from the *British Journal of Ophthalmology's* recent review of the Final Report of the Departmental Committee on the Causes and Prevention of Blindness. It reads: "Syphilis is the direct cause of not less than 10 to 15 per cent. of the blindness at present existing in this country. It is the innocent who suffer most, as shown by the high incidence of congenital syphilis as a cause of blindness in children." This terrible disease attacks the cornea or clear portion of the eye; it comes on between the ages of five and fifteen, and runs a long, painful and wearisome course, spoiling the child's school-days, and often leaving the sight permanently damaged to a greater or less extent. Is this not a truly appalling picture to contemplate? and the evil is largely preventable.

(ii) *The education of the visually defective child* presents problems that now demand our attention. Such a child cannot be taught and managed side by side with healthy young people. The difficulties of such a course are obvious. Skilled opinion is steadily inclining towards the necessity of meeting this very difficult situation by the establishment of training institutions where such children, and others similarly affected, can be educated together under conditions which are favourable to their special needs. The object in view is to ensure that they get the individual attention they require, under teachers specially trained to deal with the partially or wholly blind. Such teachers are provided with the necessary apparatus and are trained in methods which experience has taught us are most helpful. Not only are State schools of the kind being opened, but private institutions are springing up to supply the need of those who can afford them and who wish to avail themselves of their services.

Hay Fever.—This is a most distressing affection, which appears year after year in the same patient, beginning in the early summer, and lasting six to eight weeks or more. There is a distressing discharge from the nose and eyes, with great itching of the latter, causing the subject to rub his eyes continually, and making his life a misery. So long as he keeps in towns he may suffer very little, but if he goes into the country or anywhere near flowering plants, he is at once attacked. A great deal of work has been done on the subject, and it has been found that just as some patients are more susceptible than others to the action of a particular microbe—such as that of scarlatina, of boils, etc.—others are likewise very susceptible to the action of different pollens. One lady recently told me that there were three flowers whose presence was poison to her, one of these being pinks. It is now known that a vaccine can be made to antagonise the poisonous influence of these pollens, and so to render the patient immune to their toxic influence. There are two points to be borne in mind : (1) it is necessary first to find out the kind of flowers or grass responsible for the trouble in each particular case, and (2) to begin the course of vaccines some time before the trouble is expected to commence. It is necessary as a rule to consult a specialist who has made a study of this particular subject.

Phlyctenular Disease of the Eyes.—This is a very important disease, because it is fairly common. We meet with it most often in young people about the age of puberty, and it attacks the cornea (or clear portion of the front of the eye) especially at or near its margin. Small ulcers form in this position, and are accompanied by much watering, and intolerance of light; the lids are often closed spasmodically, and the patient then buries his head away from light in his bedclothes, his hands or anything that he can find for the purpose. The trouble may last a long time, and may prove very intractable to treatment. Slight and unimportant scarring may remain behind as witness of the past mischief, or, on the other hand, there may be severe scarring and much interference with vision. The disease is often connected with disease of the nose or throat, or both. Eczema of the face and scalp, and of the region just surrounding the nose, is not infrequent. It is generally believed that this disease is intimately connected with tuberculosis of one form or another. The main point of interest to the public lies in the fact that this form of ophthalmia is essentially one of those conditions which call for close team work, between the ophthalmologist, the nose-and-throat surgeon and the general physician. One point more: the old treatment of shutting these patients up in a dark room is all wrong—hopelessly so, indeed. What we want to do is to get the child under as healthy conditions as possible; especially do we want to get him out into the open air and sunlight. It is, of course, necessary to shield the eyes from light, or the patient's life will be intolerable. But whilst doing this by the aid of dark glasses, shades, etc., we must carry on vigorous open-air and sunlight treatment. Never forget that fresh air and sunlight are most powerful remedial agencies, and of much more value than the great majority of medicines. This has been very wonderfully proved in the Home started by the late Lord Mayor of London, Sir William Treloar. It is not strange that there are people in the East who worship the sun; we owe it far more than most of us guess.

Other Tuberculous Diseases of the Eyes.—Before I leave this subject I want to say a few words about other tuberculous infections of the eye. These are probably commoner than they are generally thought to be. There are a number of rather obscure eye inflammations in which tubercle plays a part. If we want to cure our small patients of such troubles, we must first know that they are caused by tubercle, and then we must set to work by long, patient and careful use of suitable treatment to build up the body resistance to the infection. Let me here turn aside for a moment to explain the difference between what may be called the newer medicine and the old. Formerly we were content to diagnose an inflammation of a part, and then to treat it very largely by local means. To-day we make our diagnosis by methods in which we make free use of our knowledge of bacteriology. In order to satisfy ourselves as to the probable cause of the trouble we are asked to treat, we now frequently call in the help of specialists in various other branches of medicine and surgery. We recognise that our own knowledge is limited, and that to get a reliable opinion as to the state of various organs we must go to different specialists, and avail ourselves of their expert knowledge of their own particular subjects. Thus an inflammation of an eye may be only the leaves and fruit, as it were, of a poisonous plant growing elsewhere in the system. It may be due to an abscess sac at the root of a tooth, to a collection of fluid in one of the air-cells of the nose, following an attack of 'flu, to some focus of tubercle in the chest or abdomen or to any one of a number of other causes. What we want to do is to get at the root of the mischief; that root may lie, if I may carry on the simile, not in the ophthalmic surgeon's garden of the eye, but in that of some other surgeon or physician. He goes to his colleagues and asks them to find out and to attack the root of the mischief, and so to kill off the evil leaves and fruit that are appearing in and causing trouble to the eyes. I say all this because I want to press home two lessons on you: (1) the necessity for team-work amongst doctors, and (2) the primary importance of treating the root cause of an illness and not only its symptoms. In future, don't go away with the idea that we are a trades-union whose members are trying to make jobs for each other, but understand our point of view, which can be put in a very few sentences: (i) we must know the cause; (ii) medicine is so vast and varied that we cannot hope to be expert in all its branches; therefore (iii) we want to get the most expert advice we can in order to get the patient well as soon and as safely as possible.

SOME DISORDERS OF THE SKIN DURING SCHOOL LIFE AND THEIR PREVENTION

By H. W. Barber, M.B., F.R.C.P.

When I was asked to deal with "Some Disorders of the Skin during School Life and their Prevention," I accepted with pleasure, not only because the subject is the concern of one of the most, if not the most important and responsible sections of our profession, namely, the school medical officers, but also because many of the diseases of the skin that occur in childhood and adolescence involve fundamental questions of dietary and personal hygiene, are often the outward and visible signs of possibly serious organic disease, and are the manifestations of disordered functions which, unless corrected early, may persist and lead to endless trouble in later life.

In order to approach the subject in a logical and intelligent way it is essential to adopt some sort of classification of the diseases of the skin that are likely to occur during school life, and are of importance from the point of view of the individual child affected and of those responsible for the care of him and his fellows. It will be understood that we are not concerned with the eruptions of the specific fevers, or with casual diseases, such as pityriasis rosea, psoriasis, and lichen planus, which may occur at any age and are of no particular interest to school authorities except as regards their diagnosis. The classification that I have adopted is as follows:

(1) Diseases due to animal parasites.

Pediculosis capitis.
Scabies.

(2) Diseases due to infection with the higher vegetable fungi.

Ringworm of the scalp and glabrous skin (*Tinea Tonsurans*, *Tinea Circinata*).
Ringworm of the groins, hands and feet (*Epidermophytosis*).

(3) Diseases due to infection with bacilli.

Comedo of acne.
Tubercular eruptions.
  (*a*) Lupus vulgaris.
  (*b*) The Tuberculides.

(4) Diseases due to infection with Pyogenic cocci.

Streptococcal infections.
  Impetigo contagiosa.
  Intertrigo.
  Ecthyma.

Staphylococcal infections.
  Boils.
  Pustular acne.
  Seborrhœic dermatitis.

(5) Diseases due to infection with Filter-passing organisms.

Warts (*Verruca vulgaris*).
Molluscum contagiosum.

(6) Toxic eruptions.

(*a*) *Due to focal or systemic infection with micro-organisms.*

- Erythema multiforme.
- Erythema nodosum.
- Purpura.
- Urticaria.

(*b*) *Due to toxins other than bacterial.*

- Urticaria papulosa.
- Certain forms of eczema.

(*c*) *Due to toxins, bacterial or otherwise, acting on the nervous system.*

- Herpes zoster.
- Herpes catarrhalis.
- Alopecia areata.
- Vitiligo.
- Scleroderma.
- Prurigo.

I cannot, of course, deal with all these to-day, but shall select a few of the more important. Taking first infection with animal parasites, apart from fleas and bugs, the head-louse and the acarus of scabies are the only two that are likely to infest school-children. The body-louse and the pubic- or crab-louse may, it is true, do so, but they are found far more frequently in adults, the body-louse having a particular predilection in civilian life for old people, although under war conditions it was no respecter of persons, and was probably responsible for more wastage, by causing temporary disability of the troops, than any other single cause. The head-louse, as you know, is very commonly found among the children of the poor, particularly, as might be expected, in girls. The female parasites are extremely prolific, it having been computed by Nuttall that a single one lays from 250 to 300 eggs, at the rate of about 70 a day. Infection is spread by direct contact, as when two or more children sleep in one bed, and by promiscuous interchange of hats and hair-brushes. I have met with a case—the daughter of a well-known theatrical manager—in which the parasites were undoubtedly conveyed by a wig. Owing to the irritation set up by the crawling and biting of the lice, the child scratches, and infection of the scalp with pus-forming organisms results, so that crusted lesions of impetigo, boils, etc., are found. The hair may become matted together with purulent discharge, bacterial decomposition occurs, and a characteristic and peculiarly nauseating odour is produced. I have seen a girl with her head so badly infested that a seething mass of parasites could be detected at a considerable distance, and, as she approached me, some actually fell on the floor. The secondary septic infection of the scalp causes enlargement of the glands draining it, and these may soften and break down, forming large abscesses. The unwary may miss the actual cause of such glandular enlargement, and I remember a nurse who had been accidentally infected in hospital, and in whom the diagnosis of tuberculosis of the glands of the neck and even of Hodgkin's disease had been discussed.

As regards treatment and prevention, the method of destroying the parasites and nits advocated by Dr. Whitfield is so simple, successful and free from risk that I think it is to be preferred to any other:

"The patient, unless of extremely tender age (any age over three years is great enough), should lie on her back on the bed with the head projecting beyond the edge over a basin placed on a chair. A sufficiency of a hot 1 in 40 carbolic acid solution should then be poured over the head from the front into the basin in which the hair lies. The solution is then emptied back into a jug, and poured over again and again until it is quite certain that the hair is all saturated. The hair is then only lightly squeezed out, and the whole head done up in a rough turban with an old piece of flannel, and this is left for from one hour for a small child to two hours in the case of an adult with thick hair. It is not necessary to wash the hair, which may be simply dried, as the carbolic acid does no harm, though it causes some desquamation of the scalp."

Prevention of spread in schools must necessarily depend on the early recognition and treatment of infected heads, and the sterilisation of hats by stoving or by renewal of linings. The problem, however, is complicated by the fact that it is difficult or impossible to guard against re-infection in the home, unless one has the willing and intelligent co-operation of the mother.

Scabies is, perhaps, of greater importance to medical officers of health and general practitioners than to day-school authorities, for the simple reason that the female acarus, who is responsible for most of the trouble, is very susceptible to her surroundings: her habits are nocturnal and her activities are excited by the warmth of the bed. It follows from this that contagion almost invariably takes place at night-time, either by sleeping with an infected person or indirectly by occupying a bed previously slept in by one, the bed-linen not having been changed or sterilised. It is obvious that casual infection is often derived from prostitutes, so much so, in fact, that scabies has actually been classified as a venereal disease, and, among the homeless, doss-houses are a fertile source of spread of the disease. But persons of cleanly habits and irreproachable morals may acquire it by sleeping in hotel beds, and thus in private practice scabies is relatively common among commercial travellers. During and after the War, infection from hotel beds was very common among civilians owing to the number of officers and men who came over on leave with scabies, which had either not been detected or had been unsuccessfully treated. I remember in 1919 seeing a most immaculate old gentleman, who had spent several weary months and much money at Bath and Harrogate in trying to rid himself of what had been diagnosed as "gouty eczema," whereas his intractable itching was really due to scabies, which he had almost certainly acquired shortly after the War in an hotel at Folkestone. Among families of the poorer classes infection of both parents and all the children is almost certain to result if any one member of the family contracts the disease, owing to the promiscuous use of bed-clothing and the necessity of sharing the limited bed accommodation. In better-class families such generalised infection is also not very rare, and is due to small children being taken into the parental bed for a while in the morning. In my experience a common sequence of events among these is that the nurse or maid, who looks after the baby or children, brings the disease into the house, conveys it to the baby, who in turn infects its mother, and she in the fullness of time infects her husband.

The main points I wish to emphasise are that scabies is almost invariably spread by direct contact in bed or by means of infected bed-clothing, and that to sleep with an infected person or in a bed previously occupied by one, the linen not having been sterilised or changed, is practically tantamount to acquiring the disease. On the other hand, the risk of doing so by the ordinary contact of daily life is practically nil. In hospital out-patient departments and during the War I have handled thousands of cases of scabies, and have never been infected.

From what I have said, therefore, it will be clear that the preventive treatment of scabies is largely a matter of complete eradication in the home. It is quite useless to treat one individual in the household unless the remaining members are carefully inspected; it is also, of course, essential to carry out the treatment of all the infected persons simultaneously, and to sterilise all the under-linen and bed-linen that has been used by them. In private practice I always insist that the servants as well as every member of the family should be examined before treatment is begun. These principles are, of course, recognised by medical officers of health and by the L.C.C. school authorities, and inspection of houses, in which cases of scabies are reported, is undertaken and facilities are provided for the thorough disinfection of under-linen and bed-clothing. Owing to these measures the number of cases of scabies met with both in hospital and private practice is certainly much smaller than before the War, although, of course, there was an enormous increase in both types of practice during and for several months after the War.

Ringworm.—From the practical point of view ringworm as met with among school-children in this country is due to two kinds of fungus: one, the *Microsporon audouinii*, which is the cause of the great majority of cases of scalp ringworm (*Tinea tonsurans*) and is also responsible for patches on non-hairy parts (one form of *Tinea circinata*); the other, the *Epidermophyton inguinale*, which is the common cause of ringworm of the groins (the so-called "Dhobie-itch" of the tropics), and of the hands and feet. Other species of ringworm fungi are, of course, found in children, many of which are derived from animals. Favus, a form of ringworm which produces scarring of the scalp and persists through adult life, is now very rare in England, although cases of mouse-favus occurring in human beings are recorded from time to time.

I shall here deal only with ordinary ringworm of the scalp, and with the form that affects the groins and extremities. It is not too much to say that scalp-ringworm is one of the curses of school-life, and a brief explanation of the course and evolution of the disease will make clear why this should be so. The ringworm fungus infects and grows in the superficial layers of the skin, and on most non-hairy parts it is easily destroyed by antiparasitic applications such as iodine, sulphur, mercurials, etc.; but on the scalp it invades the hair itself and grows downwards along the hair-shaft to the depths of the hair-follicle, where no antiparasitic substance applied externally can possibly reach it, and this fact, which is often not appreciated even by medical men, explains why ringworm of the scalp is so difficult to cure by local applications. The disease begins on the surface of the scalp as scaly, slightly pink patches, due to the growth of the fungus in the superficial layers of the skin; in this stage cure is possible by the vigorous application of antiparasitics, but in practice a case hardly ever comes under observation until this early stage is passed, and the hair itself is invaded. When this occurs the infected hairs break off and remain as characteristic greyish-white stumps, which on microscopical examination are found to be packed with the fungus; the cuticle of the hair is broken up and eroded.

Now it is obvious that, since it is quite impossible for any external application, however vigorously rubbed in, to penetrate to the lower parts of the hair-shaft and the depth of the follicle, the only way of curing ringworm of the scalp by local measures is to cause the infected hairs to fall out in their entirety. They cannot be pulled out with forceps, as they break off when tension is applied. Complete epilation can only safely be effected in two ways—one, by setting up inflammation of and suppuration in the hair-follicles, which leads to shedding of the hair, by means of irritant applications such as croton-oil or a 50 per cent. ointment of salt and vaseline, the other by the use of the X-rays. A certain drug, thallium acetate, administered internally will cause shedding of the hair over the entire body, but in sufficient dosage to effect this it causes toxic symptoms. Now treatment by producing suppuration, and spontaneous shedding of the hair, with croton-oil and similar irritants, although it may eventually prove entirely successful, is so tedious and requires so much expert supervision that to my mind it is useless as a method of dealing with cases occurring in schools and among hospital out-patients. From time to time "new methods of treating ringworm of the scalp without X-rays" are published in all good faith; not one of them is of the slightest use unless it produces suppuration and shedding of the hair. As Sabouraud points out in his classical work on ringworm, almost every year sees the publication of some new formula or modification of an old one as a "specific" for the treatment of scalp ringworm, and every one, when tested by the expert dermatologist, goes to join the long list of remedies tried and found wanting. The explanation of the ill-founded claims made for these remedies lies partly in the fact that several scaly infective conditions of the scalp are wrongly diagnosed as ringworm, and partly in that it is easy to destroy the fungus on the surface of the scalp by the use of antiparasitic substances so that great improvement in the clinical *appearance* results, but in course of time, when the treatment is discontinued, further spread takes place from the still-infected hairs, and the disease again becomes obvious.

We come, then, to the conclusion that at present there is only one satisfactory treatment of the ordinary non-suppurating form of ringworm of the scalp, and that is by the use of the X-rays. It is the only treatment that one can conscientiously recommend, bearing in mind the tediousness and lack of certainty of other methods and the consequent serious length of absence of the child from school. Many people are under the impression that the X-rays actually kill the ringworm fungus, whereas all they do is to cause the hair to fall out, and it is necessary after this has happened to apply some antiparasitical ointment. The great objection to the use of the X-rays—and it is a very serious on—is that in order to make the hair fall out, a full dose has to be given, and the margin between this dose and that capable of producing damage to the skin with destruction of the hair-follicles and permanent baldness is small. There have been in the past—and unfortunately they still occur—ghastly tragedies with the X-ray treatment, and the feelings of parents may well be imagined when, as a result of treatment of what they regard as a trivial complaint, their child is condemned to go through life with a scalp atrophied, disfigured, and partially or totally devoid of hair. In the hands of an expert there is no risk, but the technique is difficult, and it is not surprising that accidents occur. One important point I would emphasise is that the previous application to the scalp of irritants such as iodine, strong mercurials, chrysarobin, etc., makes the skin more susceptible to the X-rays, and I am convinced that many cases of dermatitis, with subsequent permanent damage, are due not to excessive dosage, but to the fact that other methods of treatment had already been employed, and a sufficient time had not been allowed to elapse before the exposure to X-rays was made.

To sum up: the prevention of ringworm of the scalp must necessarily depend on the early recognition of the disease, and the segregation of infected cases. Every medical student, however ignorant he may decide to be of skin diseases, should at least be compelled to learn to recognise ringworm of the scalp when he sees it, and should be taught the facts that I have tried to lay before you. The only satisfactory treatment is *complete* epilation of the hair of the whole head by means of X-rays: to attempt partial epilation is to court disaster. The treatment must be carried out by experienced radiologists.

One point of interest is, that at about the time of puberty a natural immunity to ordinary scalp-ringworm is developed so that the disease dies out spontaneously. In adults it is excessively rare to see ringworm of the scalp. Attempts have been made to produce such immunity by inoculation of vaccines made from the fungus, but with doubtful or only partial success. It is possible, however, that *prophylactic* inoculation of such a vaccine might lessen the liability to infection.

With regard to ringworm of the groins, feet and hands, it is due to a species of fungus that is much commoner in the tropics than in this country. It is known as "Dhobie-itch" ("Washerman's itch"), as the fungus is thought often to be contracted through clothing which has been mixed with that of an infected person by the native laundry-man.

It has been very much commoner since the War in this country, doubtless owing to the large number of men coming from the East.

The fungus grows chiefly in (1) the groins, (2) the armpits, (3) the feet, (4) the hands.

In the groins and armpits red, slightly scaly patches are produced, with a definite margin (hence the old name "eczema marginatum" of Hebra), and these gradually spread peripherally, often healing in the centre. On the feet the fungus grows chiefly between the toes, particularly between the fourth and fifth, and third and fourth.

It produces scaliness between the toes, and sometimes painful fissures: the fungus grows outwards over the sole of the foot just as it grows downwards in the groins, but there is usually less inflammation, the patches on the feet being scaly with some eczematous vesicles.

On the hands similar scaly eczematous-looking patches occur, but sometimes the fungus may be responsible for an acute eczematous dermatitis of hands and feet.

The disease is comparatively easily cured in the groins and armpits: less easily on the hands, and with great difficulty on the feet.

A person with infection *in the groins* may spread the disease via lavatory-seats, underclothing, football shorts, and shirts, towels, etc. For this reason it is very common to have epidemics of it in schools, colleges and other institutions. Lavatory-seats are the most common source of infection, but in one epidemic it was shown to be the chair-covers of a smoking-room in a hospital college.

Diagnosis.—In untreated cases the diagnosis is usually easily made at a glance by the expert, and the fungus can be demonstrated under the microscope by soaking scales taken from the patches in a solution of potash.

As I have said, the disease is comparatively easily cured in the groins, if properly treated, but unfortunately it is very liable to spread to the feet and less commonly to the hands.

It is owing to the researches of Dr. Whitfield in this country and Dr. Sabouraud in Paris that this form of ringworm of the hands and feet has been recognised.

Formerly many patients were treated for "gouty eczema" or "intertrigo" when they were really suffering from what we call "eczematoid ringworm of the extremities."

Recently there has been an epidemic of the disease in several public schools: I have explained how the infection is spread when the groins are involved, and it is easy to understand how it may be contracted on the feet, *e.g.* by walking barefoot at swimming baths and in bathing sheds, wearing other people's socks, etc. I remember one case of a servant-girl who had the disease on her hands, and there was little doubt that she had contracted it by washing the socks of her master, whose feet were infected. So common is it on the feet in the East, that I do not remember ever having seen a European who had lived for any length of time in China without contracting it. Frequently, however, people may be quite unaware that their feet are affected, as they may suffer little or no discomfort. In hot weather, however, and in persons who perspire freely a good deal of irritation and often an eczematous dermatitis is set up. Unfortunately the nails both of the hands and feet may become involved.

As regards treatment and prevention:

(1) In the groins and armpits swabbing the affected parts morning and evening with a 2 per cent. solution of salicylic acid in spirit, followed by the vigorous application of Dr. Whitfield's benzoic and salicylic ointment is usually effectual. It is advisable to continue treatment for a week or so after apparent cure. Preventive measures consist in sterilisation by boiling or stoving of pants, shirts and vests, and in thorough swabbing of lavatory-seats with a strong solution of lysol.

(2) On the hands the use of the above ointment is also usually successful unless the nails are affected. In resistant cases, an ointment containing chrysarobin may be used.

(3) On the feet, owing to the thickness of the skin, complete cure, once the disease has become established, is almost impossible to promise. Relapse often takes place months or even years after apparent cure. It is probable, that, as Dr. Semon has suggested, persistent infection of one or more nails may account for the recrudescence between the toes. A thorough course of treatment with chrysarobin ointment applied at night-time, and the use of a foot-powder containing salicylic and boric acid during the day-time, will usually bring about an apparent cure, and the subsequent routine use of the foot-powder will often prevent any further trouble. When the nails are involved, nothing in my opinion short of their complete removal, followed by dressing of the nail-beds with chrysarobin or iodine, will cure. Even then relapse is common. Needless to say, socks and stockings should be sterilised.

The last and to my mind the most important subject with which I wish to deal concerns a group of eruptions of the skin which are usually grouped together under the name "seborrhœic eruptions." Seborrhœa is the term given to an excessive greasiness of the skin, most evident on the face, scalp and back, due to an exaggerated, and in all probability vitiated, secretion from the sebaceous or oil-glands. The importance of this seborrhœa is that it predisposes those in whom it occurs to infection of the skin with certain germs, which produce the so-called seborrhœic eruptions. These are as follows :

Dandruff or scurf of the scalp, due to superficial infection of the skin with a kind of yeast-organism.

Blackheads or comedones, due to infection of the follicles with the acne bacillus.

Pustules, boils, carbuncles and certain other forms of eruption due to staphylococci.

Ordinary mixed or polymorphic *acne* in which blackheads, pustules, boils and abscesses usually occur together.

Seborrhœic dermatitis—a term which is employed for a variety of types of eruption, but which for practical purposes may be regarded as a kind of catarrh of the skin, due to infection with the scurf-organism and staphylococci of various degrees of virulence.

Now the manifestations of what I call the *seborrhœic state* may be seen from infancy to old age. It may be looked on as a product of civilisation, and I am convinced that it may occur in animals, such as dogs, when they are condemned to a life of leisured ease and over-feeding with improper food.

I must speak now of only one manifestation of the seborrhœic state, namely, *acne vulgaris*, which begins and often lasts throughout school life and sometimes well into middle age, but what I have to say as regards its cause and prevention applies equally to the other seborrhœic eruptions. I will first give you a brief clinical picture of a person with acne:—*The scalp* is greasy from seborrhœa, and very scurfy from infection with the yeast organism. *The face*—particularly the forehead, cheeks and chin—and perhaps the *back*, *neck* and *chest*, are covered with blackheads and superficial pustules or "spots": many of these spots contain actual yellow matter or pus, others are red indolent papules, which may persist for a long time and do not form matter. In the severer cases abscesses and boils may occur which lead to deep and disfiguring scarring. It will be observed that the skin of the affected parts is intensely greasy and the secretion of the sebaceous glands—or sebum—can be seen as little droplets of oil at the mouths of the sebaceous follicles.

This acne—the most important manifestation of the seborrhœic state in school life—has been the subject of much controversy as regards its cause. There is no doubt that the actual lesions which compose it—the blackheads, pustules, etc.—are due to the active growth in the skin of certain germs, to which reference has been made, and there is no question that seborrhœa is the primary condition which predisposes to this secondary active bacterial growth. We have, therefore, to ask ourselves why some children develop this greasy skin and the secondary infection, and why some remain immune. Many people stress the influence of puberty, at which time the sebaceous glands become larger and much more active than in early childhood, and I am sorry to say that many doctors attempt to comfort parents by assuring them that acne is a natural accompaniment of puberty and adolescence, and that the child will "grow out of it." This to my mind is a most unwarrantable view to take: it is true that acne tends to get better in adult life, at which time, however, it is usually succeeded by other manifestations of the seborrhœic state; it is true that there is an obvious connection between acne and the development of sexual maturity, and in girls the acne is nearly always worse just before and during the menstrual periods, but this is equally true of other infections. To fold one's hands and regard acne as an act of God against which there is no redress may save one a great deal of trouble, but it may ruin a girl's life and render a boy a self-conscious recluse. A neglected acne may lead to extensive scarring of the face and back with permanent disfigurement; it is therefore essential that thorough and vigorous treatment should be instituted at its earliest appearance. What, then, are the predisposing causes of acne and other seborrhœic disorders, and how may they be prevented and treated?

(1) *Heredity.*—I would first stress the importance of the hereditary factor. It is not a constant one, but it is extraordinarily common to meet with seborrhœic families.

(2) *Diet.*—This to my mind is the most important factor of all, and I could easily devote a whole lecture to the question. Briefly, the chief characteristic of seborrhœic persons is an inability to deal with an excess of starchy and sweet food and with certain forms of fat—particularly pig-fat. I am aware that a long-suffering public is at present being deluged with quasi-medical advice in the daily press as to what it should and should not eat. In the first place, it is impossible to lay down rules which are applicable to everyone; hence the grave danger of dogmatic assertions which are read by all and sundry. But there are certain principles that can be laid down:

(*a*) The amount a person eats should correspond to the amount of exercise he takes. This would seem self-evident, yet the vast majority of people fail to grasp its importance. How often does one see an athlete abandon his games for the claims of business, and yet continue to eat as much and to drink, perhaps, more alcohol than before? The result is that the food is imperfectly oxidised and an accumulation of acid waste-products takes place with which his excretory organs fail to deal; the skin takes on a vicarious excretory function and seborrhœic manifestations appear.

(*b*) Starchy and sweet food is largely made use of by the muscles; consequently a person living a sedentary life requires relatively little. Yet bread, pastry, puddings, buns, cakes and sweets form the staple diet of many girls condemned to an indoor sedentary life, and of many women whose sole exercise is housework. It may be taken as an axiom that we were never meant to eat *soft* starchy food or concentrated sweet stuffs.

(*c*) Briefly, the staple articles of diet from childhood upwards should consist of a certain amount of freshly-cooked meat, fish, poultry and eggs, an abundance of green vegetables, salads and fruit, and a good wholemeal bread and butter. Ordinary white bread, puddings, pastry, porridge and other forms of *soft* starchy food, and sweets, jam, marmalade, etc., are unphysiological, and it is precisely these foods which, in a person with a seborrhœic tendency, predispose to acne and other seborrhœic disorders.

Fortunately the diet at our preparatory and public schools has vastly improved of late. The tuck-shop, except in that it enables boys to buy fresh fruit, is an abomination and should never be required.

(3) *Constipation.*—Since the seborrhœic state is largely a question of imperfect excretion of waste products, it stands to reason that the intestinal and renal functions must be investigated and regulated. Boys and girls should be taught the importance of taking plenty of fluid and of acquiring regular habits.

(4) *Clothing and Sunlight.*—Excessive and unsuitable clothing predisposes to the development of seborrhœic disorders, not only by favouring the growth of micro-organisms on covered parts, but also by interfering with the proper functioning of the skin and by depriving the body of the stimulation provided by cool air and sunlight. The extraordinary improvement that takes place in the texture of the skin, the muscular development, and the general physical condition of persons undergoing treatment at clinics such as Leysin and Alton must be seen to be appreciated. It is probable that the stimulating effect of cool pure air, playing on the whole surface of the naked body, is responsible for the undoubted superiority of true heliotherapy over artificial light baths.

THE VALUE OF SPORT AND PHYSICAL EXERCISES

By E. B. TURNER, F.R.C.S.

STRENUOUS games and athletic sports have an effect on children of school age, both bodily, mental and moral.

First of all, with regard to the effects on the body. To make the matter quite clear it is necessary to give a short account of the physiology of motion. The human machine works on exactly the same lines as a motor-car or a steam-engine. Various substances are burned up in the human furnace in exactly the same way as the mixture of petrol gas and air is burned in the cylinders of a motor-car, or coal in the furnace of a steam-engine. Of course it is not meant by this that every motion of the body is accompanied by smoke and flame, or that it is necessary to carry about a box of matches to strike and light up the furnace to produce a movement, but that the combustions are in reality the result of chemical combinations of the same nature as those which occur when strong sulphuric acid (oil of vitriol) and water are mixed in a glass vessel, when very considerable heat is produced.

If there are to be combustions there must be fuel to be burned. Every action which takes place in the human body is dependent upon the supply of food and drink; and the fuel which is burnt up in order to produce motion is derived from the food taken into the system. Part of this food is rapidly absorbed into the blood and burnt up at once without becoming an integral part of the body. But Nature is a very wise old lady and does not at all care to commence a winter with an empty coal-cellar. She therefore stores up a reserve of fuel in the human body in the same way that a wise person stores coal in anticipation of frost. This reserve of fuel is also obtained from the food, but in this case the food, having been digested and absorbed, has become an integral part of the body.

The chief reserve store of fuel is the fat which is deposited in and over the body, as well as sugar and other chemical substances, which need not be further particularised.

The movements by which athletic games and sports are carried out are chiefly dependent on the proper action of the arms and legs, working in harmony with the other parts of the body. These limbs are built up on bones of various lengths and sizes, which are jointed together so as to allow free movement. The bones entering into the formation of a joint are enlarged at their ends, and covered with a very smooth substance called cartilage, and ligaments joined together by strong flexible fibrous bands, which are so arranged that they can bend and move freely. Nature, however, is a great engineer and knows that to ensure free and frictionless movement every joint must be properly lubricated. Therefore to each joint is supplied a bag of joint oil (synovial fluid), and every movement is therefore perfectly smooth and free from friction. The actual movements of the limbs are produced by the muscles, consisting of bundles of fibres, which have the wonderful vital property of contraction. The muscles, as a rule, are attached by one end to a bone above a joint, by the other end to another bone below a joint, so that when they contract and their ends are approximated, the joint is flexed, and when the muscular fibres are relaxed, then the joint can again be extended. Thus, by the alternate contraction and relaxation of the muscles attached to the bones above and below a joint, movement of the limb is made possible.

There is here all the machinery necessary to produce the movements of the body, but it is of no use unless it can be set in motion. A muscle can be stimulated and made to contract by a blow, a pinch or a galvanic current, but it would not be convenient if it were necessary to strike or pinch a limb or carry about a galvanic battery and switch it on every time it was required to move an arm or a leg. Nature, however, supplies the necessary machinery. Muscles can be made to contract by an impulse transmitted from the brain to the muscle through the motor nerves. The brain, situated within the skull, has passing from it the spinal cord, which is contained in the canal of the backbone, and from which nerves passing off are distributed to every muscle in the body. The brain is the organ of the will and the intellect, and orders there originated are transmitted by the nerves to the muscles which they supply; in obedience to which orders those muscles contract. In this way, under the auspices of the brain and nervous system, the whole body moves, lives and has its being.

Nothing is ever lost in this world. If a piece of wood be burned it might appear as if it were destroyed, but after the burning there is just as much organic material in the universe as there was before it was set on fire. After it is burnt, what is left are the "ashes," into which it has been converted, and various gases and vapours which have passed away into the air. These ashes and vapours and gases in a changed form constitute just as much material as there was in the original piece of wood.

In the same way, when matter is consumed in the human furnace it is changed in form, leaving ashes and gases and vapours, which must be eliminated from the system because they are poisonous, and their retention would be exceedingly deleterious to the organism. These poisonous ashes are excreted from the body by the lungs, skin, kidneys and intestine, and it is essential that all these organs should work perfectly well and smoothly in order that life may be maintained. If a man be hanged by the neck he very rapidly dies, because he cannot get rid of the carbonic acid, one of the products of the combustion of his tissues, from his lungs, and he dies suffocated.

The skin is an exceedingly important organ of excretion, much more so than is generally appreciated. Many years ago a little boy was taken round an Italian city on a fête day, stripped, varnished all over and covered with gold-leaf, to represent a golden Cupid, or some such allegorical figure. At the end of the fête, when they went to take him down from the car on which he had been paraded round the town it was found that he was dead, poisoned by the excretions which could not pass out through the blocked pores of his skin.

If the kidney be diseased and unable to do its work efficiently, as is the case in Bright's disease, a person very soon dies from the effects of the poison retained in the system.

When a muscle is working and contracting, a much larger blood supply is sent to it, and therefore it is affected by any substances which may be circulating in the blood stream. This is an important fact to remember when considering the phenomena of fatigue. The blood leaving the left side of the heart bright, pure, and full of oxygen, carries to every part of the body the materials necessary for the maintenance of its health and efficiency, and at the same time gathers up from every part the burnt-up ashes and poisonous materials which are produced as a result of muscular exertion. It then passes from the arteries into the veins and is carried by them to the right side of the heart, where it arrives in a poisonous and contaminated condition. It is then driven through the lungs, where it gives off these impurities and absorbs the oxygen necessary to maintain life from the atmospheric air with which it there comes in contact.

The question of fatigue is of importance. If a muscle be continually urged to contract by means of the stimulus of the will, in a short time it will be tired and the movement and contraction will be stopped by pain local in the muscle itself, which is caused by the friction and pressure on the small nerves which pass through it, and also by the accumulation within its substance of burnt-up poisonous ashes. Also there will be pain centrally in the brain owing to the necessity for it to give a much stronger impulse to the tired muscle. If such a muscle should be stimulated by a strong galvanic current it will be able to contract again, and if the strength of the current be increased, that contraction will go on until the muscle is absolutely fatigued and unable to respond to any stimulus whatever, however strong it may be. This effect cannot be produced by the will because it is prevented by pain.

Breathlessness is a general symptom of fatigue, and is caused by the fact that more work is being done and therefore that more carbonic acid gas and other poisonous materials have been poured into the blood than can be easily eliminated when the lungs are working at ordinary pressure. Therefore if the exertion be continued and more and more poisonous materials accumulated in the blood, it will be necessary for the rate of respiration to be increased until finally, if no rest be taken, breathlessness ensues owing to the inability of the heart and lungs to clear the system of the poison sufficiently rapidly.

"Recreation" really means "Re-creation" or the rebuilding of the body, brain and tissues by healthy exercise.

Every small cell in the body has the wonderful power of taking from the blood with which it is supplied that which is necessary for its maintenance and renewal, and if during exercise parts of the body are burnt up and destroyed, they are reproduced from the material conveyed by the increased blood stream which is attracted to the exercised parts. Nature is very lavish, and the supply of nutriment necessary to replace them is so liberal that they become larger, stronger and more healthy. In this way by bodily exercise the body is renewed, re-built and re-stocked with health and energy. Considering these facts it becomes evident that exercise is good and necessary for all persons, men, women and children, but in each case the amount of physical exertion undertaken must be proportioned to the capabilities of the individual.

Every child of school age before going in for strenuous games and athletic competitions should be medically examined, or its school records carefully inspected in order to see that it is sound and that the three great essentials, heart, lungs and joints, are in proper working order. Some children are only fit for modified exercise, or for some game or pastime which does not put an undue stress on any doubtful or damaged organ. They will improve physically in every way by such regulated exercise, but they are not fit to go down into the pit and experience the joy of strenuous athletic competition. Other children will be found fit for some of the less exacting games, and others will be ready to take on those games and sports which are the most strenuous of all and reap physical benefit and health from participation in them. But no rules can be laid down setting forth which games and which sports are fit for different children of definite ages. Some young boys and girls are much more developed earlier in life than others of the same age, and it is foolish and unscientific to put them all on the bed of Procrustes and lop or stretch them to one uniform pattern. I have often been very rude to my own profession and stated that it is composed of fools and physicians. A fool treats the illness, a physician the patient. In this matter of adapting children to the games which will improve and strengthen their physical health and ensure perfection of their bodies, it is necessary in every case to study the individual and not the mass when it comes to a question of what games and sports they may or may not attempt.

Every child before it is allowed to take part in real hard games such as hockey, football or lacrosse, or to compete in athletic sports, should be encouraged to train and to get as fit as possible. Training should be gradual, beginning very easily, and as strength and stamina increase, gradually pushed. By so doing the muscles will become hardened, enlarged and capable of increased exertion. The heart will be prepared to do the work of driving the extra blood stream to the exercised parts, and the lungs will therefore be more ready to take their share in the gradual attainment of the perfection of condition. Not only will the muscular elements of the body become stronger and more capable of hard exertion, but the brain power will also be increased and a more strenuous impulse will be imparted to the contracting muscles.

During the whole of the training of children they should be carefully watched to see that development takes place on right lines, and above all things good "style" should be cultivated. If two persons, other things being equal, are competing against each other, the one with the best style is sure to win, because good style means that the object is attained with the least possible expenditure of force. A batsman like Hobbs will send a ball to the boundary with a flick of his wrist, whereas another person with great action sends the same ball trickling to silly point.

Everything which has been set forth up to the present is applicable to both boys and girls at school. Both sexes by going in for sports and playing games will improve the whole of their physical conformation and condition. In all games and sports the brain becomes tired before the muscles. A person is much more tired if he has walked five miles by himself than if he has covered the same distance without thinking of the actual walking, talking and laughing with other people. Many times in a game if things are going wrong the side gets its "tail down" and the players feel tired and exhausted. Then suddenly if by some chance something happens which shows there is still a chance of winning, the whole side brightens up, the muscles which appeared so exhausted resume their strength, and the whole team making an effort frequently carries the side to victory. The brain was more exhausted than the muscular system.

A person learning to ride a bicycle is much more easily tired when he has to remember how to keep his balance and how to pedal than when he has become expert and the pedalling and balance become automatic.

Every movement and every action leaves an impression on the nervous system, more especially on the grey ganglia of the spinal cord, until in time such movements as walking are carried on with practically no active intervention of the brain itself at all.

The Emperor Commodus turned ostriches loose in the arena for the amusement of the Roman populace, and when the birds were running at full speed their heads were cut off by soldiers with long sickle-shaped knives. Muscular tissue can contract for some little while after death, and although with the heads removed these ostriches were dead, the stored-up impressions in their spinal cords enabled them to run the whole length of the arena until they were finally brought up by the barriers on the other side.

It is evident that fresh air is absolutely essential to children and young persons who are working and going in for athletic games. It should be impressed upon every parent that fresh air is absolutely essential and that every window should be open day and night. No harm ever comes from a proper allowance of fresh air—colds are not caught and illnesses are prevented. The clothing of children should also be loose and not too heavy, and the food simple and nutritious, given at intervals, and all "munching" between meals prohibited.

The effects of exercise suited to each particular child will have the result of increased growth, strength and efficiency of the whole bodily system. To those who are not fit to take part in strenuous competitions the exercise will be as a walking-stick or crutches to help them over the rough places until they are sufficiently sound and well to do more. To those who are fit and well it will increase their capabilities for work, not only physical, but mental and intellectual as well. To obtain the very best results the whole matter should be carefully considered and as far as possible directed by experts.

In everything I have said up to the present I have included both boys and girls, and up to the age of twelve or thirteen they can play and compete together quite well, but later on it is not wise for strenuous mixed games to take place between boys and girls of sixteen to seventeen or eighteen. The muscular development of a girl is built upon a bony chassis which is not adapted for excessive speed or very strenuous exercise, and if mixed games and competitions take place between boys and girls over the age of adolescence, the result will be one of two things—either the game or the girl will be spoilt; the game, if it is played down to the speed of the girl; the girl, if the game is played at its usual speed and she is allowed, with that pluck which so many girls have, to pull herself to pieces in attempting to keep up the speed and pressure of the game as set by the men. All serious competitions after that age should be kept separate, girls with girls and boys with boys.

Children should not over-exert themselves in competitions. Their metabolism is very active, their combustions very energetic, and a young boy or girl over-doing strenuous games or exercise might easily develop some serious mischief which would be a lifelong handicap. A great mistake is often made in encouraging schoolboys to compete in a large number of races and other competitions in the same afternoon. No absolute rule can be laid down as to the number or the distance of the races which a boy of fourteen or fifteen should undertake. In each case it should be decided by the physical capabilities of the boy if it be possible to evaluate them. The same, of course, applies perhaps even more forcibly to girls of the schoolgirl age. The Commission which considered the question of strenuous games for girls some three years ago, and which took an enormous amount of evidence, came to the unanimous opinion that, provided a girl was sound to commence with, properly looked after and allowed to get fit, she might do anything which a boy of the same age might do with regard to sports and games, with the exception of tug-of-war and Rugby football; boxing was not considered, as for women it is unthinkable.

The great improvement in the physique of young women which must be apparent to everybody who can look back twenty or thirty years is distinctly owing to the fact that during that time they have gone in very much more for games and sports of all sorts.

With regard to the effect on the intellect and morals. No game or sport is really of much worth unless it is necessary to train and prepare oneself for it. The training is of the greatest value; it teaches self-control, self-sacrifice, formation of character, makes the will control the body—" make an under-slave of it and blacken it under the eye," as St. Paul has it; the translation in the New Testament is, " I keep under my body and bring it into subjugation," but the literal translation is, " I make an under-slave of my body and blacken it under the eye."

The next most important thing is the struggle: the joy of the contest and the knowledge that you are doing your best, whatever the result may be; and last of all is the win. The win is very nice, to excel is excellent, but it does not produce the good effects which are the result of the preliminary training and the joy of the struggle to excel. For this reason team games are of such extraordinary value; teaching as they do the necessity to play for the side, to subjugate personal advantage and opportunity to the good of the community, and to carry on to the last possible moment, because that last little effort may be that which just turns the scale in favour of the side for which the individual may be playing. In individual contests the great thing to inculcate is gameness; not to give up when feeling done, but to fight it out to the bitter end. This gameness will help boys and girls to carry on in the same way in their intellectual work and in the greater affairs of after life, as they did when they were running or playing and declined to know that they were beaten.

Some authorities are inclined to say that a free indulgence in games does not conduce to good work. Some experiences are just the opposite. For example, in the year 1876, St. George's Hospital won the Shield for athletics and the Cup for football, and at the same time had the highest average of all the London hospitals at the various professional examinations held that year, and the men who won the prizes and passed the examinations were those who won the races and played in the football fifteen. Men have often trained for a prize or a scholarship and a race or big football match at the same time, and occasionally both have come off. The effect of strenuous games and athletics on the morality of young children pretty well goes without saying. Observance of the Scout rule—"clean without and clean within"—is essential if they wish to excel, and there is no question but that indulgence in games, sports and athletics makes for a very high moral tone and cleanliness of life.

There is one thing I should like to say with regard to games and sports, schoolboys and young persons. We all know the debt which sport in all its phases owes to the Press, but sometimes, in my opinion, the Press goes too far in unduly booming immature precocity. If a boy or a girl does a good performance, let it be recorded, but do not let the public Press lay too much stress upon it, as it may very possibly cause undue enlargement of the head. There are instances on record of extreme promise in youth nullified owing to injudicious and premature over-praise in the public Press.

These beautiful lines of Kipling sum up the whole case :

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> " The even heart which seldom slurs its beat,
>   The cool head weighing what that heart desires,
> The measuring eye which guides the hands and feet,
>   The soul unbroken when the body tires,
> These are the things our weary world requires
>   Far more than superfluities of wit,
> Wherefore we pray you, sons of generous sires,
>   Be fit, be fit, for honour's sake be fit ! "

PREVENTABLE DEFORMITIES IN CHILDHOOD AND ADOLESCENCE

BY COL. A. H. TUBBY, C.B., C.M.G., M.S., F.R.C.S.,

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THE Council of this Institute has formulated this course of lectures with the object of giving definite and, as far as possible, authoritative information upon certain phases of the hygienic welfare of young people. And the Council is of the opinion that the course would be incomplete unless some attention is paid to those influences, conditions and diseases which cause either delay in, or arrest of growth; or to such perversion or alteration of its direction that definite and distinct departures from the normal frame and attitude of the body are in evidence.

I am tempted to dwell for a moment upon the psychology of the deformed. Those of us who are entirely or nearly normal in shape, outline and activity fail to realise how acutely the deformed suffer mentally. They are conscious and, if I may use the word, superconscious, of their defects, and they are very sensitive (I do not use the words " morbidly sensitive," because I think those words are not justifiable, considering the causation of their state of mind) about their condition. They are quick to see any glance of disparagement; they shrink from any note of criticism of their physical powers and capacities. Hence, they are often shy and retiring and seek solitude rather than the company of their fellows.

The general belief, more prevalent in the Dark Ages than in our times, that a deformed body shelters a twisted and even malign mind, is happily countered by the experience of those who have long been in contact with cripples. It would seem that in the majority of them their bodily weakness and failings make them intensely sympathetic with the woes and sufferings of others. Owing to their super-sensitiveness they have often a high appreciation of the beautiful in persons and things around them; and, if their sorrows are great, their joys are abounding. It is true that in some instances for which we have historical authority, a bodily deformity leads to active resentment against the people and conditions which surround them, and many such people become morose and cruel. Perhaps the most striking historical example of this is Richard Plantagenet—Crookback—the vicious and malignant Richard III. Yet, I do not think that his deformity can be said to have caused his nature to have become so vilely warped. On the contrary, he was, as I have said, a Plantagenet, and therefore inherited the evil qualities of that race. For, from the time of Fulk the Black they had been the victims of violent and ungovernable temper; they had often been cruel, lustful, headstrong, disinclined to listen to reason. So that whilst as a race they possessed great abilities as warriors, administrators, legislators, yet all too frequently they sullied their good qualities by their unbridled passions.

Fortunately, many classes and types of deformities are both preventable and curable, even some of the most severe of the congenital and paralytical ones.

My objects here are not to deal with the cure of deformities, and no direct reference will be made to the question of treatment, but the objects are better still, viz. their prevention. It would be impossible for me to range over the whole of so vast a subject, which embraces every activity within the scope of orthopædic surgery; and so I will confine myself to the discussion of four outstanding causes of malformation of the human frame, viz. rickets, postural defects, infantile paralysis and tuberculosis.

THE PREVENTION OF RICKETS AND ITS ASSOCIATED DEFORMITIES

We must ask what is meant precisely by the term "rickets"? It is, briefly, a disease of infancy, early childhood and adolescence, due to faulty feeding and bad hygiene, affecting every tissue of the body, but more especially the bones. You will note that I have said early childhood and adolescence, and these last words indicate the periods at which the disease usually appears. Hence there are rickets and "late rickets." As to the identity of late rickets with the rickets of childhood, there has been much discussion. Observations at the present day seem to show that they are the same affection.

During an attack of rickets the essential feature, so far as the bones are concerned, is softness due to deficient deposit of phosphate of lime or calcium phosphate in them. The results are soft bones, *i.e.* bones which bend beneath the weight of the body, and yield to the strain of muscular action, so that we see knock-knees, bow-legs, curved spines. As rickets usually occurs just at the time of rapid growth, so its effect is most marked on those portions of the bones where growth is most intense, *i.e.* at the growing lines and at the ends of the bones. Hence, the bulbous appearance of the ends of the thigh, spine, shoulder and forearm bones. I need not enter into the histological or microscopical appearances indicative of the changes at the growing lines; they are very familiar to the pathologist and they are characteristic.

It has already been mentioned that rickets affects all the other tissues of the body: thus, the ligaments which brace the joints are softened; and, supplementing or preceding the loss of hardness of the bones, cause further distortion of the skeleton. A notable example of this is rickety flat-foot.

Unfortunately, too, the muscles, the blood vessels and the lymphatics suffer. The muscles lose their natural tensile elasticity: they stretch and yield. The effects of the change in the blood vessels and lymphatic systems are still more disastrous. An outpouring of fluid takes place into the central cavity of the brain and expands it. At the same time the bones of the skull are unduly softened. The skull, or brain case, expands *pari passu* with the brain and the child's head steadily becomes larger. It suffers from "water on the brain," or hydrocephalus.

Such are some of the deformities produced by this preventable disease. I may, however, diverge for a moment from the main theme of my subject and put the question, What is the outlook for these patients? If rickets is recognised early, the morbid process can be arrested by good food and sound hygiene before any deformity has appeared, and the child will grow up strong and straight. Treatment, however, may not have been commenced until deformities have set in. It is possible, then, to combat the rickets and remedy the deformities. Finally, the child may be seen when deformities are pronounced, the head much enlarged and the ends of the bones bulbous. Treatment will still arrest the disease, but the sufferer will carry with him the stigmata or physical blotches of rickets all his life.

It is now time to turn to rather more complex matters and ask what, in addition to faulty food, are the elements of bad hygiene, which, if they do not actually cause rickets, yet aggravate it? I think we may dismiss the idea that direct septic infection plays any part. What we do recognise is that want of fresh air, especially of air in motion (*cf*. Leonard Hill's experiments), deprivation of exercise and sunlight, want of cleanliness and, above all, close confinement to stuffy rooms, all contribute towards the sum-total of the incidence of the disease.

And here I may mention a very interesting observation made by Dr. Hutchison at Nasik, in India. It is generally accepted that rickets is a disease affecting the poor, and it is so in this country, at least in its advanced form. I have, however, been struck by the large number of children of well-to-do parents who suffer from softness of bones and relaxation of ligaments, especially of the feet and legs, and I am often asked: Why is it so? The answer is to be found only by patient research into the feeding and environment of the child. I shall speak on this point later, but now I must revert to Dr. Hutchison's observations. He found that at Nasik, whilst the small children of both rich and poor alike suffered from rickets, yet it was only the adolescent girls and not the boys who suffered from "late" rickets. The explanation is, that whilst the boys were allowed to be in the open air and take plenty of exercise, the girls, being "purdah," or hidden, were kept in confinement in harems; and doubtless they ate too many sweets, which contributed, by the development of excessive amino-acids in the body, to the elimination of phosphate of calcium.

Whilst the contributory causes are as I have mentioned, yet the actual causation is the diminution of deposit of calcium phosphate in the bones and the body generally. What, then, are the causes and changes or aberrations of calcium phosphate deposit?

We may sum them up thus:

1. The amount of calcium phosphate supplied to the body may be insufficient owing to deficiency of that material in the food and in the water. This touches on the question of appropriate diet, with which I shall deal presently.

2. Or, sufficient or even more than sufficient lime salts or calcium phosphate may be supplied, yet there is produced in the body such an excess of acids that the lime-salts are either excreted by the bowel, and less so by the kidneys, before they can, so to speak, reach the bones through the blood. There is evidence to show that an excess of carbohydrates or starchy diet in the food, such as in white bread, potatoes and sweets, has a definite effect in getting rid of or eliminating the lime salts, and actually preventing their deposit in the bones and tissues.

The matter, however, is not so simple as the first two possibilities seem to indicate, for we may supply an abundance of lime salts and yet the child becomes rickety.

Experience and experiment have taught us that, not only must the varying constituents of the food be properly *balanced*, but that it must contain certain vital and essential substances, which are known as vitamins; and it is by their influence that not only does growth proceed in the bones and tissues of the body, but also that an adequate amount of lime salts is deposited in them.

Let me now turn to the first proposition—deficiency of calcium phosphate in the water and food supply, and let me make a few observations on drinking-water.

It is well known that rickets are more prevalent in those cities and areas where the water is soft, *i.e.* where the amount of lime salts is less than normal. It is stated that when soft water from Loch Katrine was supplied to the city of Glasgow, there was not only a great increase in the number of children affected by rickets, but also that it assumed a much more severe form.

In a certain district near London, where the water was very hard, it was decided to reduce it to a condition of softness by precipitating the lime salts, because they furred up the boilers and pipes too readily. The precipitation of the lime salts was so effective that the children of that district soon became rickety. Some were brought to me; and as I knew what had been done with the water in the district, I advised that a certain proportion of lime salts should be added to the water supplied to the children, and that a soluble preparation of lime salts should be given daily; with the result that the children soon began to show rapid improvement.

Is it permissible for me to relate a personal experience? I happen to be on the Executive Council of a large boys' school situated in a very healthy position in the country, where the hygienic arrangements are above suspicion and the diet supplied is excellent for growing lads; that is to say, it is a balanced diet, in which the various necessary elements are supplied in proper proportions. On a certain day I attended a meeting of the Executive Council and the question was raised, what was to be done about the hardness of the drinking and other water, because it caused so much annoyance and expense owing to the furring up of the boilers and pipes?

The Council had already obtained estimates for the cost of installing water-softeners, and were about to proceed with the matter. I ventured to ask them to reconsider the question, and inquired if they had thought of the effects of the soft water on the growth and on the bones of the boys. I pointed out that if they carried out their plans there was every likelihood of an acute outbreak of late rickets owing to the children being deprived of an adequate amount of lime salts. The Council were, if I may say so, staggered by this view of the matter; they accepted my opinion, and all question of incurring the expense of softening the water was abandoned. They recognised, after a little explanation, that the damage to the children's health would cost more per annum than the annoyance caused by furred-up boilers and pipes.

We must now turn to the difficult and complex subject of diet. I see that you have already heard a lecture here on the diet of school-children; and I do not propose to go into it *in extenso*, but merely to dwell on certain points concerning the relations of the quality supplied as affecting the proper growth and development of the infant, child, and adolescent.

DIET

In my early medical days I was taught that the uses of food are: (1) to supply sufficient energy to maintain the heat of the body and to provide energy for movement; (2) to repair the waste of tissue and to supply the material for continuous growth of the young. I may remind you that the elementary principles of diet are classified as proteins, hydrocarbons or fats, carbohydrates or starches and sugars, certain salts, and water. From the points of view of bodily nutrition and normal growth, foods may be divided into two kinds—"good" food, which supplies vitamins, and "bad" food, which does not.

Now, not only must the diet be good, but also its constituents of protein, fats, carbohydrates, and salts and water must be so supplied that there is not too much or too little of one or more elements. Further, the foods must be of such a quality and so cooked that the vitamins are not destroyed. In fact, food must be fresh and its constituents properly balanced. Excess in one direction and deficiency in another will be harmful.

For the young a sufficiency of fresh, clean, unskimmed, unsterilised milk is an ideal diet, but it is too bulky and too expensive.

For the schoolboy—a small quantity of meat twice daily; one and a half ounces of butter, fresh vegetables, fresh fruit, $\frac{3}{4}$ pint of milk, and bread containing at least 80 per cent. of stone-ground flour will meet all requirements.

A diet containing these constituents in proper balance will supply all the energy required and all the vitamins. Thus Vitamin A (fat soluble vitamin) is found in butter, milk, green vegetables, and to a less extent in meat. Vitamin B (anti-neuritic) in brown bread and vegetables. Vitamin C (anti-scorbutic) in milk, vegetables and fruit.

Defects of Diet

Bread.—Up to about the year 1870 our people lived on bread produced from the strong, native wheat which was stone-ground. It was possible to obtain wholemeal bread, and a large proportion of the population ate it. At home, when I was a boy, two kinds of bread were always baked—white bread containing a fair admixture of the husk and germ, and brown bread containing all the constituents of the grain. It is now difficult to obtain flour or meal stone-ground, and it is a lamentable sight to see the old stone-grinding windmill falling to pieces in this country, because there is no call for stone-ground flour. My view is that the grain which is grown in a given country is that which is best adapted for the needs of the people of that country. Hence I deprecate the feeding of our people on foreign flour. This change of habit may account for the great prevalence of soft bones and relaxed ligaments amongst the children of all classes.

We have, however, bowed our knees to the Baal of

Commerce; we have failed to support our own agricultural industries; we have neglected the farmer, and he finds it pays him better not to grow wheat and barley, but to lay down his land in pasture and to rear stock. And we are now paying for it.

Roller-milling is a complicated process, and it is estimated that the flour so produced travels a couple of miles through rollers and sieves before it is ready for the market. The net result is that the skin and the germ, which contain the greater part of the protein, most of the fat, and some of the Vitamins A and B, are removed as bran and offal and are used to feed pigs. The remainder is the white flour of commerce, and even this is subjected to a bleaching process. It is treated with nitrous oxide and even with fluorine gas. These last abominations loudly call for interference from the Legislature.

It is thought that if we order and eat the so-called brown bread we shall be safe. It is not so, for the words "brown bread" may mean anything. It may mean a quantity of flour prepared as above with a little bran thrown into it; and there is no guarantee given as to the proportion of the husk and germ present. Genuine wholemeal bread should contain all parts of the seed or berry of the wheat, which alone makes true brown bread.

Man cannot, however, live on bread alone, for there is too much carbohydrate in it in proportion to the fat and protein; and there is evidence to show that excess of carbohydrates prevents the deposit of calcium and potassium salts in the bones and other tissues.

MILK

Of milk there is much which may be said—very much more than is possible here. I will only refer to its bacteriological impurities, and say that these can be rendered harmless by heating milk to 145° F. in a suitable arrangement. This is called pasteurisation. Of other articles of diet it may be said that the ordinary methods of preparing and cooking lower very largely their value as articles of diet, and Leonard Williams has reminded us that " our real foods are raw foods." So, we find that dried milk has only half the anti-scorbutic value of fresh milk, and that canned or tinned vegetables lose 75–90 per cent. of their anti-scorbutic power.

RICKETS-PRODUCING DIET

A rickets-producing diet is one in which there is an insufficiency of vitamins and the constituents are not in their proper proportion, *i.e* it is unbalanced. It is one which delays or prevents the calcification of bone, whilst it may have an excess of those constituents responsible for the growth of tissue. It is no use to stimulate the growth of the bones unless they are duly hardened. Excess of carbohydrate or starchy elements in food is one of the chief predisposing causes of rickets. The actual causation is insufficiency of vitamins.

VITAMINS

Vitamins are essential elements of foods and exert a potent and indispensable effect upon nutrition, although present in infinitesimal quantities. Vitamins have been obtained artificially in concentrated forms in suitable media, and the concentrated forms are 100–900 times stronger than they exist in their natural conditions.

There are at least three vitamins, perhaps a fourth, and possibly certain others.

The three well-recognised ones are:

Vitamin A.—Fat soluble, found in cod-liver oil, butter, egg-yolk, milk, fat of meat, dripping and herrings. This vitamin is essential for growth, and there is evidence to show that it contains in itself another active principle—the antirachitic vitamin which governs the deposit of lime salts in the bone.

Vitamin B.—The anti-neuritic one, the absence of which gives rise to widely spread forms of paralysis, such as beri-beri when polished rice is supplied as diet instead of whole rice; or when bread is deprived of its germ and husk; or if peeled vegetables are eaten, such as potatoes, or potatoes which have been boiled in water and not steamed. Vitamin B is found in peas, beans, lentils, liver and yeast.

Vitamin C.—The water-soluble vitamin or the anti-scorbutic. It is found in fresh fruits, raw green vegetables, steamed green vegetables and potatoes.

The vitamin which immediately interests us is Vitamin A, and cod-liver oil and fish-liver have it in the largest and most active amount. Its origin is instructive. Animals cannot make vitamins, they must derive them directly or indirectly from plants and vegetable tissue. The history of Vitamin A in cod-liver oil is believed to be this:—Under the influence of sunlight, various algæ and diatoms manufacture Vitamin A. Minute sea animalculæ eat the green algæ and diatoms. These animalculæ are eaten by small fish, and these in their turn by large fish such as cod. It is also certain that more Vitamin A is contained in milk obtained from cows which are fed on summer pasture, and therefore in the open air and sunlight, and have plenty of exercise.

We have already stated that a sufficient amount of calcium and phosphorus must be taken into the body and retained there. But the matter is not so simple as this, for rickets is produced when there is an excess of calcium and diminution of phosphorus in the serum, equally as certainly as when there is an excess of phosphorus and diminution of calcium, that is to say, a definite calcium-phosphorus balance must exist in the blood before it can be deposited in the bone. Now Vitamin A, or its anti-rickety constituent, governs and determines the stability or otherwise of the calcium-phosphorus balance, and the activity of the vitamin is stimulated particularly by sunlight and ultra-violet rays.

Speaking of vitamins in general, I have hinted that Vitamin A contains two elements—a growth factor and an anti-rachitic factor, and the evidence is this:—If cod-liver oil is oxidised by passing a current of air through it, American observers have found that such cod-liver oil always fails to stimulate or support growth, but it is still potent as a prophylactic against rickets. It is therefore clear that the anti-rachitic vitamin is less oxidisable than the growth Vitamin A.

EFFECT OF LIGHT RADIATION ON RICKETS

It is a most significant discovery that certain fats and oils, such as cotton-seed oil, which have no Vitamin A and no anti-rachitic vitamin, can be made strongly active against rickets if they are exposed to ultra-violet rays;

and, what is still more significant, such vitamins are remarkably stable. Such inert fats contain substances called sterols, and it is supposed that one of these, named cholesterine, is activated by the ultra-violet rays and produces the vitamins. Similarly, it is known that the activity of the skin can be vastly increased by radiations of sunlight and ultra-violet rays, and it is surmised that it is the cholesterine in the skin which is so affected.

These observations introduce us to the influence of sunlight and ultra-violet rays upon rickets. There is no doubt that radiation of light increases the metabolism of phosphorus and calcium, and promotes a normal calcium-phosphorus balance, and it does this by increasing the range of activity of Vitamin A and of the anti-rachitic Vitamin D.

But sunlight and ultra-violet rays cannot entirely replace the essential constituents of the food. According to Mellanby the position is this :—If a child is well fed, the presence or absence of light does not affect the question of the production of rickets; for in the absence of sunlight and ultra-violet rays, rickets do not develop. Secondly, in a child fed on a moderate but insufficient anti-rachitic diet, sunlight will prevent rickets. Thirdly, in a child fed on much starchy food with deficiency of the proper fats and of lime, and phosphorus, sunlight and ultra-violet rays will not prevent rickets, but they may ameliorate the symptoms.

Thus, then, I have traced the genesis of rickets. Its prevention is a simple matter. Diets containing sufficient Vitamin A and anti-rachitic vitamin are absolutely preventive, and light radiation is a very valuable adjunct. All weakly children should have the opportunity of being exposed under skilled supervision to ultra-violet rays for fifteen to twenty minutes twice or thrice weekly. Every elementary and some secondary schools should be fitted up with an apparatus. It is not an expensive matter, and will add enormously to the well-being of the nation.

DEFORMITIES ARISING FROM ABNORMAL STATIC AND POSTURAL CONDITIONS

Here I should explain the meanings of the words "static" and "postural." When an inert body is retained in a certain position, that position is the resultant or total effect of forces, such as inertia, friction,. gravity, which act upon it. These forces are called static because they cause the body to stay, stand, or be still in a given position. In the case of a living entity, such as the body, which may be either at rest or in action, or partially so, not only static forces come into play, but certain positions are assumed owing to the action of the muscles, sometimes in consonance with, and sometimes in opposition to, static forces, and these positions are called postural.

It is difficult to demarcate the influence of static and of postural effects on the body in all cases. However, I think we may safely say that any cause which gives rise to an inequality of the two sides of the body, or of the limbs, or asymmetry, comes within the limits of the definitions of "statics" and "postural."

I should like to say a few words as to asymmetry. During the course of practice I have seen a very large number of spinal curvatures of the lateral description, and very early I was struck by the fact that in a considerable proportion, over 50 per cent. of them, there was a condition of asymmetry—sometimes it was that one leg was shorter than the other, due either to congenital or acquired causes, more often congenital, and sometimes hereditary; at other times the pelvis was smaller and the leg shorter on one side than the other; and at yet other times the half of the body, the arm and the leg on that side, was smaller. The asymmetry even extends to the face, and if we examine people's faces carefully, many will be found to be asymmetrical. From an artistic point of view this is said to add to the piquancy and lightness of the expression. If this condition of asymmetry of the body and the leg is allowed to continue, the spinal column, made up of a number of superposed discs, ceases to remain erect and inclines to one side, particularly if the muscles and ligaments which bind the discs together are weakened from any cause. Here, we have a static effect on the spine and its influence in producing spinal deformity, especially in the young. Spinal curvature is prevented by artificially correcting the shortness of one lower limb by adding to the sole and heel of the boot on one side an appropriate thickness of leather and cork. If one side of the pelvis and one lower limb are affected, in addition to thickening the sole of the boot, a pad must be supplied and so arranged that the patient's pelvis is raised on the short side when he sits. Thus, the asymmetry is neutralised, the spine becomes erect, and the static forces acting on either side of the body become equalised.

As an example of postural curves giving rise to deformities, I would instance the affection known as congenital wry-neck, due to over-action and shortening of one sterno-mastoid, say, for example, the right.

If the contraction is left untreated, there follows curvature of the cervical or neck portion of the spine, and both the skull and the face become asymmetrical and deformed. The skull, from being symmetrically ovoid in shape, changes into an irregular ovoid. As to the face, the changes are more marked. We have instanced the right as the side of the contracted sterno-mastoid, and its effects are that the right side of the cranium is flattened, the face is smaller on that side, the right eyebrow is lower, the nose is deviated to that side, and the angle of the mouth is apparently raised, *i.e.* the distance between the outer point of the right eyebrow and the angle of the mouth is lessened, *i.e.* that side of the face is smaller and deviated to the right. The cervical spine is also curved to the left.

There is also associated a notable defect of the eyes. They are astigmatic, *i.e.* the corneæ of the eyes are not parts of perfect spheres, but are flattened in one direction and too prominent in the other, *i.e.* the meridians are not equal. If the contraction of the sterno-mastoid and the position of the head are rectified, then a remarkable change takes place in the deformed parts: the spinal curvature gradually disappears, the face becomes equal on its two sides and the astigmatism lessens. From a series of observations which I have made on children and adolescents, this change is sometimes effected in from one to three years. To remedy the deformity is very simple: divide the contracted sterno-mastoid, and, if required, the other structures in its neighbourhood, reverse the position of the head and neck, and stretch the muscles on the opposite or left side.

I would like to dwell for a few moments, upon a malposition of the head which is due to astigmatism, where there is no contraction of the sterno-mastoid. The head is held on one side because the child is born with astigmatism; but, be it noted, there is no contraction of the muscles and no asymmetry of the face and head. In order to show how astigmatism will cause deviation of the head, and even spinal curvature, let us take a case of right-eyed astigmatism and the position assumed by the individual in writing. Children were taught, and sometimes are now, to write the sloping or Italian hand, *i.e.* a hand sloping away from the axis of the eyes. If the eyes look directly forward, the right forefinger and thumb obscure the point of the pen and the child cannot see what he is doing. Further, the bridge of the nose blocks the view of the left eye. Therefore, in order to see the point of the pen, the writer inclines his head to the right and twists it.

The remedies are to correct the astigmatism and to teach children to write an upright round hand, so that they can see the point of the pen and sit square to their work.

How urgent is the need for recognising the importance of preventing deformity is shown by the results of a careful examination made in America of first-year students entering Yale University. Presumably, these students were of the best physical class in that country, yet over 50 per cent. showed some defects in posture, others curvature of the spine, yet others some degrees of flat feet or flat chest. In fact they constituted an approximation to our C3 type.

Doubtless, there was some feeble muscular development, but that was not all. Their "muscle sense" had not been educated. It is by this sense that we keep our balance unconsciously; and we maintain the upright or any other position. This sense should be educated, as are the others. Let me take an example from a case of lateral deviation of the spine. I maintain that it is useless merely to order massage and physical exercises. What is required is for the patient to acquire first of all a conscious appreciation of what is, and what is not, the erect position of the body. In order to do this, I mark out with a carbon pencil a thick black line, passing down the structural mid-line of the body from the top of the sternum to the pubes, and ask him to note its deviation from the normal. I then teach him certain exercises designed to remedy the deviation. At first the exercises have to be partly passive, *i.e.* the straightening of the body, and therefore of the carbon line, must be assisted by pressure of the surgeon's hand in certain directions, and the patient is asked to assist the pressure by active muscular movements. Gradually, an intelligent patient requires less assistance from the surgeon and does more for himself, until he can voluntarily and completely straighten the line. This means he has now reached the first steps in a reformed "muscle sense.". He requires to go on practising before a glass twice and even thrice daily, and he will soon involuntarily and unconsciously use his reformed muscle sense and stand erect and sit properly. In America the Posture League was formed twelve years ago, to educate the public as to the ill effects of mal-posture, and it has done good work.

So much for static and postural deformities.

DEFORMITIES RESULTING FROM INFANTILE PARALYSIS (POLIOMYELITIS)

In order to understand how deformities arising from this disorder can to a considerable extent be prevented, we must grasp the fact that the distribution of the paralysis is very capricious. Thus, it may affect one limb or all four limbs. It may be such that it affects some groups of muscles in a limb, or only one group; and, indeed, not all the muscles in that group may be affected, but only one muscle. In the mildest cases merely some fibres of a muscle are weakened.

Once we know the geographical distribution of the paralysis, we, realising the functions and actions of affected parts, can at once forecast correctly what will be the type of paralysis in the limb, and we should be able to predict exactly what deformities will follow, unless measures are taken to prevent them.

The question of prevention then resolves itself into one of intelligent anticipation of the effects of the withdrawal of the nerve control from various parts.

The factors which give rise to post-paralytic deformities are the effects of gravity, the influence of position, and the preponderating action of unaffected muscles on the various segments of the limb. Let us illustrate this by the foot, when the anterior muscles of the leg are paralysed. As the child lies in the recumbent position, the front part of the foot falls forward by the action of gravity, and it is sometimes allowed to remain in this bad position. When the child gets up and attempts to walk, the front part of the foot again falls forward by gravity; and the action of the healthy and unopposed calf muscles " points " the foot still farther.

Certain preventive measures are necessary from the first, viz. the partially paralysed foot must be kept at a right angle while the child is in bed or walking about. The posterior healthy muscles must be stretched daily, and efforts made by warmth and gentle massage to conserve what power remains in the anterior muscles. These are preventive measures of deformity, and they are intelligently anticipative.

Prevention of Tuberculosis Deformities

I think it may be safely said that the chief cause of crippling of children and adolescents is tuberculous infection of the bones and joints.

This was certainly the case twenty years ago, when it was estimated that over 60 per cent. of cripples owed their disability to this cause alone, and I think it is true now, so far as the young are concerned. Within the next decade there will undoubtedly be a great improvement in these figures.

The battle against surgical tuberculosis has been a long one, and since 1903 it has been a winning fight. In the early days of my surgical career, cases of surgical tuberculosis were taken into urban hospitals and there subjected to operations, which were designed to remove the local manifestations of tuberculosis, and were far from successful in doing so. The points that were overlooked were, that these operations were done in the tainted air of urban hospitals, and the patients, after a few weeks' stay, were sent to their unhealthy homes. So struck was I by the disastrous results of this treatment so far as the paucity of cures and the suffering inflicted upon the patients were concerned, that

I instituted a statistical inquiry, embracing the figures from all the London Children's Hospitals for one year. The results of this inquiry led me to advocate warmly the abandonment of most of the operative procedures and the removal of the patients as soon as the disease was manifest to the seaside or the country, where they could obtain very prolonged rest in the best surroundings, until the disease was cured. It is true that I encountered a good deal of opposition, but it is satisfactory to me to record that my chief opponent in 1903, a surgeon of undoubted eminence, had become in 1910 an ardent advocate of the new plan of treatment. Gradually in this country, and more rapidly in the United States, rural hospitals and institutions sprang up. There is no doubt that a great deal of deformity was thus avoided, and a larger percentage of recoveries ensued than under the older plan.

The further progress of this form of treatment sounds almost like a subject of romance. In 1913, Dr. Rollier, of Leysin in Switzerland, brought before the International Medical Congress the results of his treatment by rest and sunshine in the Swiss mountains—rest and heliotherapy. It was at once seen that an immense advance had been made in treating surgical tuberculosis. Cases of Pott's disease, which ordinarily gave rise to humpback, were healed without deformity, movement was restored to painful and partially deformed hip and knee joints, and discharging sinuses, which were gradually draining away the patient's remaining strength, began at once to improve and eventually healed. Even dead bone was extruded in some cases painlessly, and the sores healed up.

Unfortunately, in this country we cannot command the advantages incidental to a Swiss mountain climate. Our atmosphere is humid and is often vitiated by smoke, so that a large proportion of the sunlight is lost in or near our large towns. This is an iniquity and it is largely preventable. When we read in the Coal Commission's Report that the amount of smoke and soot delivered wantonly and wastefully into the air is equivalent to the carbon contained in three whole days' production of the total number of coal-pits in this country, we may well stand appalled. It is a striking condemnation of our wasteful and haphazard methods, and ought to be sternly prevented by legislation. And no doubt in a more enlightened age it would be so.

Happily, a very efficient substitute has been found for sunshine, viz. the ultra-violet ray and the carbon arc lamp. Indeed, in one particular they have an advantage over sunshine, because in the latter there are some rays which are harmful, whilst the majority are helpful to the body; whereas, in the artificial rays only those are selected and used, which are known to be of direct antidotal power to surgical tuberculosis.

Thus, I have traversed the field which I set myself to cross, and have shown you how, with wise preventive measures, a great deal of deformity and misery may be avoided, and the nation as a whole rendered more healthy.

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